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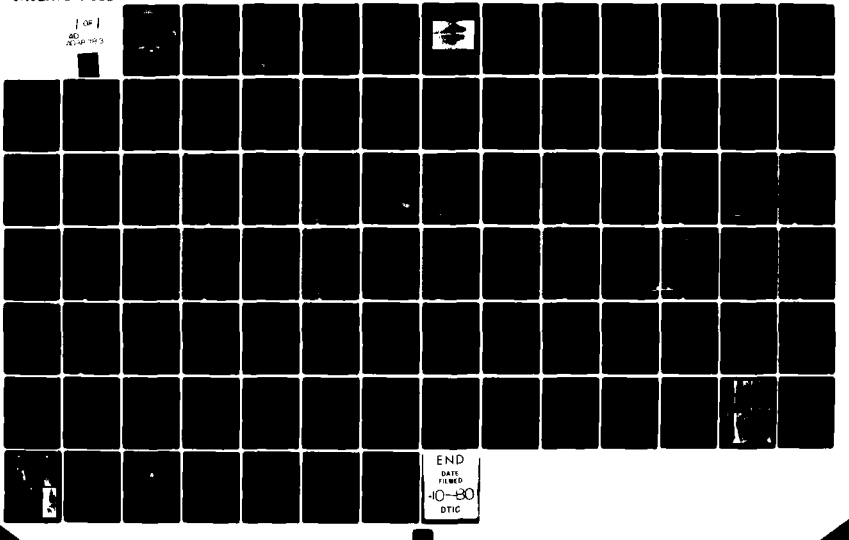

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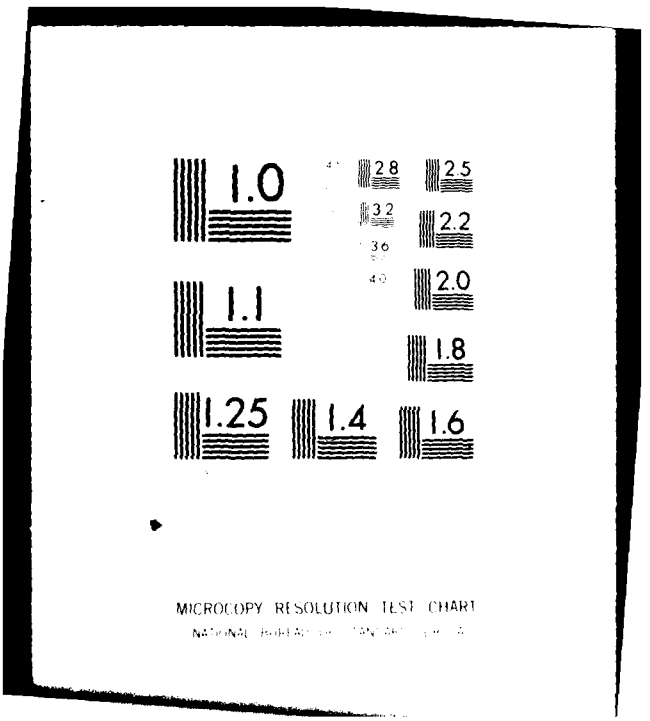
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LEVEL II

OHIO RIVER BASIN
BROAD FORD RUN
GARRETT COUNTY,

MARYLAND

NDI I.D. NO. MD 36

LITTLE YOUGHIOGHENY RIVER SITE NO. 6

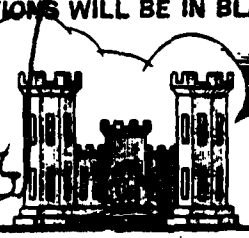
(BROADFORD RUN DAM)

AD A088203

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

Broadford Run Dam, Little Youghiogheny River Site
Number 6, (NDI I.D. Number MD-36) Ohio River Basin
Broadford Run.
Garrett County,
Maryland
Phase I Inspection Report



DACW 31-79-C-0038

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase 1 investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigation and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase 1 investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase 1 inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Little Youghiogheny Site No. 6
STATE LOCATED: Maryland
COUNTY LOCATED: Garrett
STREAM: Broad Ford Run, a tributary of the Little Youghiogheny River
DATES OF INSPECTION: April 11, 1979, May 24, 1979, and July 19, 1979
COORDINATES: Lat. 39° 25', Long. 79° 20.5'

ASSESSMENT OF GENERAL CONDITIONS: Based on the evaluation of available design information and visual observations of conditions as they existed on the dates of the field reconnaissances, the general condition of Little Youghiogheny Site No. 6 is considered to be fair.

This fair condition classification is specifically based on the visual observation of a seepage zone located at the toe of the dam at the left (east) side of the exit stream channel. The cause and origin of the seepage is not known with certainty. It is believed the seepage condition may represent a potential hazard to the dam. Since this wet area left of the stream channel initially developed with the filling of the reservoir it is believed to be caused by seepage through the embankment or foundation. The observed silt material contained in the seepage zone indicates piping may be in progress. Therefore, further investigation is considered necessary to ascertain the significance of the seepage to dam stability.

Little Youghiogheny Site No. 6 is classified as an "intermediate" size, "high" hazard dam according to guideline criteria. Based on Soil Conservation Service hydrological/hydraulic design computations, spillway capacity is adequate to pass 100 percent of the PMF. Therefore, spillway capacity is in accordance with recommended criteria.

The following recommendations should be implemented as soon as possible:

1) Implement study to evaluate and ascertain the significance of seepage zone located at toe of dam. Study should determine the following:

   a) Cause(s) and origin of the seepage condition.

   b) Quantity of seepage flow, and fluctuation in flow due to reservoir pool levels or ground water conditions.

   c) Quality of seepage (amount of eroded fines contained in seepage flow).

   d) Significance of seepage condition to dam stability.

   e) Recommendations for remedial measures, as necessary.

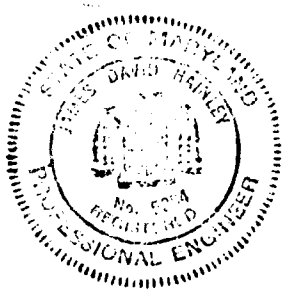
This study should be performed immediately by a professional geotechnical engineer experienced in the design and inspection of earthfill dams.

2) Place additional (suitable) rock riprap on the upstream slope berm above normal pool level.

3) Repair surficial rill and footpath erosion on embankment slopes and upstream emergency spillway channel. Backfill and resod tire ruts on the embankment crest and embankment-spillway abutment.

4) Develop a formal flood surveillance and warning plan.

5) Periodically observe wet zone located right (west) of impact stilling basin and exit stream channel for an increase in surface area or development of a seepage condition.



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LITTLE YOUGHIOGHENY SITE NO. 6

Overview of Dam

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PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM
LITTLE YOUGHIOGHENY SITE NO. 6
NATIONAL I.D. NO. MD 36

1.1 General

a. Authority. The study was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this study is to evaluate if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances

1) Embankment. Little Youghiogheny Site No. 6 was constructed as a zoned earthfill structure. The dam embankment is approximately 1,160 ft. long, with a maximum toe to crest height of 46 ft., and a crest width of 16 ft. Upstream and downstream embankments slope 3H:1V. An eight (8) ft. wide rock riprap berm is located on the upstream slope at El. 2,435, about 14 ft. below the dam crest. The rock berm extends in height from El. 2,426 to El. 2,435. (Refer to Plate Nos. 1, 1A,, and 3.)

A cutoff trench is located at the centerline of the dam embankment. The cutoff trench extends along the dam foundation and abutments up to about 18 ft. below the crest of the dam. (Refer to Plate No. 2.)

Cement grout was injected into foundation bedrock to form a curtain for the purpose of reducing seepage flow. Foundation bedrock consists predominately of highly fractured and jointed shale and sandstone and includes a fault rubble zone. (Refer to Plate No. 5 and Regional Geology, Appendix F.)

2) Seepage Drain System. Embankment seepage water is collected by filter trench drains and diverted out of the embankment by a toe drain and corrugated metal pipe outlet system. Filter trench drains are located about 50 ft. upstream from the downstream embankment toe and are excavated to a maximum depth of 15 ft. below original ground. As shown on Plate No. 4, the outlet toe drain and pipes exit the downstream embankment toe at the location of the impact stilling basin. The outlet toe drain measures about 25 ft. in width and is constructed of graded sand and gravel.

3) Flood Discharge Facilities. Flood discharge facilities include a principal spillway riser, reservoir drain, outlet pipe, and an emergency spillway channel.

Principal spillway intake works include a 30 in. dia. reinforced concrete inlet pipe, two 12 ft. long overflow weir crest openings, and a grated (drop inlet) riser roof. Principal spillway outlet works consist of a 30 in. dia. slide gate and a 48 in. dia. reinforced concrete outlet pipe. The slide gate is operated by a handwheel and lifting nut mechanism, and provides for drawdown of the reservoir. The concrete outlet pipe is approximately 192 ft. long and is connected to the base of the principal spillway riser. Water entering the principal spillway flows vertically down the riser, through the outlet pipe, and into a concrete impact stilling basin. (Refer to Plate Nos. 3, 6, and 7.)

The emergency spillway channel is cut into natural earth and is located on the left abutment. Spillway channels are 200 ft. wide, have 3H:1V side slopes, and a level section length of 30 ft. The overall length of the spillway control crest and channels is about 920 ft. (Refer to Plate Nos. 1A and 3.)

b. Location. Little Youghiogheny Site No. 6 is located in Garrett County, Maryland, approximately two miles east of Oakland. The dam is situated on Broad Ford Run, a south flowing tributary of the Little Youghiogheny River. (Refer to Regional Location Plan, Appendix E.)

c. Size Classification. The dam has a maximum storage capacity of 3,590 ac.ft. and toe to crest height of 46 ft. Based on this criteria, the dam is classified as an "intermediate" size structure.

d. Hazard Classification. Little Youghiogheny Site No. 6 is classified as a "high" hazard dam. In the event of dam failure, approximately eight (8) inhabited structures, located within a half mile reach of the dam, will be subject to substantial damage and loss of life. Approximately 3.5 miles downstream, the Little Youghiogheny River flows along the south and west city limits of Oakland, Maryland. Additional damage and loss of life would be expected to occur in these areas.

e. Ownership. Little Youghiogheny Site No. 6 (Broadford Dam), is owned by the Mayor and Town Council of Oakland, City Hall, Oakland, Maryland.

f. Purpose of Dam. Little Youghiogheny Site No. 6 was constructed for use as a flood control, water supply, and recreational structure.

g. Design and Construction History. The dam was designed by the Soil Conservation Service, Engineering and Watershed Planning Unit, Upper Darby, PA, in 1968. Little Youghiogheny Site No. 6 was constructed by Holt and Miller Contractors, Wardensville, W.VA., under the supervision of the Soil Conservation Service. Construction of the dam and appurtenances was started June 5, 1970. Grouting of foundation bedrock was performed by the John Grayson Co. of Pittsburgh, PA, and completed by December 1970. Final acceptance of the structure, excluding the seeding of the dam embankment, was made in October 1971.

In the spring of 1973, a water supply pipeline was installed across the emergency spillway channel and dam crest for the purpose of providing water to the town of Oakland, Maryland. Pipeline construction consisted of excavating a 4 to 5 ft. deep trench in the crest and spillway, and installing an 8 in. dia. heavy guage plastic pipe.

h. Normal Operating Procedure. Little Youghiogheny Site No. 6 was designed to operate as an uncontrolled structure. Under normal operating conditions, pool level is maintained at El. 2,432.0, the level of the uncontrolled weir crest openings of the principal spillway riser. Flood flows are discharged through the principal spillway riser or in combination with the emergency spillway.

1.3 Pertinent Data

a. Drainage Area	6.8 sq. mi.
b. Discharge at Dam Facility	
Maximum known flood at dam facility	Unknown
Ungated spillway capacity at design high water elevation	3,048 cfs
Ungated spillway capacity at top of dam elevation	17,000 cfs
c. Elevation (feet above MSL)	
Constructed top of dam	El. 2,449.0
Design high water	El. 2,441.8
Normal pool	El. 2,432.0
Emergency spillway crest	El. 2,437.6
Principal spillway overflow weir crest	El. 2,432.0
Maximum tailwater	Unknown
Upstream invert of outlet pipe	El. 2,403.5
Downstream invert of outlet pipe	El. 2,402.7
Streambed at centerline	El. 2,403.0±

d. Reservoir Length

Length of maximum pool	2.0 mi.
Length of normal pool	1.5 mi.

e. Total Storage

Constructed top of dam	5,000 ac.-ft.
Design high water	3,250 ac.-ft.
Emergency spillway crest	2,337 ac.-ft.
Principal spillway overflow weir crest	1,410 ac.-ft.
Normal pool level	1,410 ac.-ft.
Sediment pool	1,410 ac.-ft.

f. Reservoir Surface

Constructed top of dam	326 acres
Design high water	246 acres
Spillway crest	195 acres
Normal pool	138 acres
Sediment pool	138 acres

g. Dam

Type	Earth
Length	1,160 ft.
Height	46 ft.
Top width	16 ft.
Side slopes	
Downstream	3H:1V
Upstream (with 8 ft. wide berm at normal pool level)	3H:1V
Zoning	yes
Impervious core	yes
Cutoff provisions	Compacted cutoff trench
Grout curtain	yes

h. Regulating Outlet

Type	Concrete drop inlet riser and 48 in. dia. R. C. outlet pipe
Riser height	33 ft.
Riser dimensions	4x12 ft. interior
Length of connecting outlet pipe	192 ft.
Gates	30 in. dia. slide gate Class O-28

i. Emergency Spillway

Type	Trapezoidal earth channel
Width	200 ft.
Crest elevation	2,437.6 ft.
Gate	None
Upstream channel	Vegetated earth with a negative 1% slope
Control crest length	30 ft.
Downstream channel	Vegetated earth with positive 3 and 1% slopes
Length of channels	920 ft., curved

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available. The following available data may be obtained from the Maryland Water Resources Administration and the Soil Conservation Service.

1) Hydrology and Hydraulics. Design calculations, stage storage curves, discharge rating curves, and flood hydrographs were obtained from the Soil Conservation Service, Design Report, Little Youghiogheny River Watershed Multiple Purpose Dam No. 6, Garrett County, Maryland, dated 1968.

2) Embankment. Design information includes construction drawings, geologist's report, boring logs, laboratory soil test data, construction report, specifications, and construction quantity summaries. Information obtained from the design report identified in Section 2.1-a(1), and Construction Report for Little Youghiogheny Site No. 6.

3) Appurtenant Structures. The documents identified in Section 2.1-a(2) include as-built drawings, construction specifications, and design calculations for the principal and emergency spillways and outlet works.

b. Design Features. Dam and appurtenances were designed in accordance with Soil Conservation Service, structure classification "C" ("high" hazard) criteria. Illustrations of principal design features are shown in Plate Nos. 1 through 7.

1) Embankment. The zoned earthfill dam structure consists of an embankment core, a thin 8 ft. wide upstream shell, and a tapered downstream shell ranging in width from 14 ft. to about 55 ft. at its base. The upstream embankment shell extends from the dam foundation to about 23 ft. below the dam crest. The downstream embankment shell extends from the dam foundation to about 4 ft. below the dam crest. Compacted silty clay (CL) and clayey silt (ML) were used to construct the embankment core. Both embankment shells are constructed of compacted silty and clayey gravels (GM, GC). Earthfill was obtained from on-site borrow sources and emergency spillway excavation.

Foundation preparation involved clearing and grubbing all foundation surfaces, and removing the original ground cover to a depth of about 6 ft. and a width of about 370 ft. at the principal spillway centerline. According to as-built drawings, the cutoff trench has a base width

of 12 ft. and excavated side slopes ranging from 1H:1V to 3H:1V. The cutoff trench is extended to shale bedrock and is backfilled with compacted silty clay (CL) and clayey silt (ML) borrow. Fractured and fissured bedrock trench bottoms were treated with a dental cement grout.

Type II cement grout was used to inject a curtain in the shale and sandstone foundation bedrock to depths ranging from the bottom of the cutoff trench to 50 ft. below original ground. However, based on drill hole logs, the grout curtain apparently does not extend to the bottom of the fault rubble zone. The injected grout curtain extends about 900 ft. in length between dam abutments. The grout curtain was formed by three grout lines, offset by 4 ft. These grout lines were drilled and grouted by the split spacing method along the centerline of the dam. Three stage grouting was used at the location of the fault rubble zone (near the left dam abutment). Dam mid-section and right abutment foundation areas were grouted in two 10 ft. stages.

2) Seepage Drain System. Seepage filter trench drains consist of a 1 ft. blanket of sand installed around a gravel core section. Trench drain width and height dimensions vary from a minimum of 6x12 ft. to a maximum of 6x16 ft., respectively. About 300 ft. of 12 in. dia. perforated corrugated metal pipe was installed in the top sections of the filter trench drains and outlet toe drain to facilitate the drainage of seepage water. The outlet toe drain has a base width of 25 ft., 1H:1V side slopes, and a top width of 12 ft.

3) Flood Discharge Facilities. Details of the principal and emergency spillway and outlet works are shown on Plate Nos. 1A, 3, 6, and 7.

The principal spillway riser operates as an uncontrolled drop inlet structure. The riser is constructed of reinforced concrete and measures 33 ft. in height and 4x12 ft. in interior dimension. Riser weir crest openings are protected by trash racks composed of horizontal galvanized steel crosspieces. A 30 in. dia. reinforced concrete pipe connects the reservoir drain inlet to the base of the spillway riser. The reservoir drain pipe is regulated by a 30 in. dia. steel slide gate, housed in the spillway riser. A handwheel is used to operate the gate.

The 48 in. dia. reinforced concrete outlet pipe was constructed with six (6) anti-seep collars spaced at intervals of 24 ft. A continuous concrete cradle supports the outlet pipe through the dam embankment.

The outlet pipe end section is supported and connected to the reinforced concrete inlet wall of the impact stilling basin. Outlet pipe flow is discharged into the basin baffle block, through the basin outlets, and into the exit stream channel.

The emergency spillway is a natural earth channel excavated into sand and clayey silt soils of the left dam abutment. Channel shape is trapezoidal, with a bottom width of 200 ft. and side slope inclinations of 3H:1V. The upstream spillway channel is approximately 340 ft. long with a negative 1 percent slope. The downstream channel is approximately 550 ft. long with positive slopes of 3 and 1 percent. Spillway flows are discharged approximately 600 ft. downstream of the dam in a direction leading to the natural stream channel (Broad Ford Run).

2.2 Construction. Based on review of available design documents and field observations, it may be concluded the dam and appurtenances were constructed in general accordance with the intended design drawings and specifications. Construction difficulties were reported during grouting operations. (Refer to Construction Report for Little Youghiogheny Site No. 6.)

2.3 Operation. According to Waterway Obstruction Permit Number G-69-Ob-2, the Mayor and Town Council of Oakland, City Hall, Oakland, Maryland, are responsible for the operation of Little Youghiogheny Site No. 6.

The principal and emergency spillways are uncontrolled structures, and no performance or operation records are maintained. The only operational feature is a mechanical slide gate used to regulate the drawdown of the reservoir.

2.4 Evaluation

a. Availability. Available design information and drawings were obtained from the Dam Safety Division, Maryland Water Resources Administration and the Soil Conservation Service.

b. Adequacy. The available design information and drawings are reasonably documented, and are considered adequate to evaluate the dam and appurtenances in accordance with the scope of a Phase 1 study. Based on a review of this data, the dam and appurtenant structures are considered to have been designed in general conformance with accepted engineering practice.

c. Validity. Based on the available data, there is no reason to question the validity of the obtained design information and drawings.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site reconnaissance of Little Youghiogheny Site No. 6 consisted of:

1) Visual observation of the earth embankment, abutments, and emergency spillway.

2) Visual observation of exposed sections of the principal spillway intake structure, slide gate mechanisms, and impact stilling basin.

3) Visual observation of discernible hazardous conditions or safety deficiencies.

4) Evaluation of the downstream hazard potential.

Visual surveys were performed during periods when reservoir and tailwater were at normal pool levels.

A visual observation checklist and field sketch are given in Appendix A. Specific observations are illustrated in photographs of Appendix D.

Based on visual observations, the general condition of the dam is considered fair. This fair condition classification is specifically based on the visual observation of a seepage zone located at the toe of the dam. The observed seepage zone is located in the vicinity of the left (east) dam abutment and a fault rubble zone. The cause and origin of the seepage could not be conclusively established by visual observation. It is believed the seepage may represent a potential hazard to the dam.

The following conditions were observed on the dates of the field reconnaissances.

b. Embankment

1) Surficial. Embankment and abutment slopes are vegetated with a dense grass cover. Minor rill erosion was evident on the left (east) dam abutment junction. A shallow depression is located on the downstream slope, about 120 ft. right (west) of the impact stilling basin. Eroded footpaths extend across the upstream slope, one (1.0) ft. above the riprap berm and on the downstream embankment slope about 300 ft. left (east) of the right (west) abutment. Tire ruts, about 0.2 ft. deep, have been worn into the embankment crest. These tire ruts extend across the entire length of the crest and down the upstream dam-spillway abutment. Limestone rock riprap, exposed above normal pool level on the upstream slope berm, is disintegrating into small fragments. (See Photograph No. 2).

2) Seepage. Extensive wet zones are located below the downstream embankment toe, on each side of the impact stilling basin and exit stream channel. The wet zones extend outward from the embankment toe about 100 ft. and have a surface width of about 40 ft. (Refer to field sketch, Appendix A.)

The wet zone located on the right (west side of the stream channel may be caused by seepage and/or surface runoff. However, a free flowing seep was not identified.

The wet zone located on the left (east) side of the impact basin and stream channel is believed caused by seepage. A seepage zone was observed located about 25 ft. east of the impact stilling basin.

The observed seepage zone contains a very soft surface area (about 100 sq. ft.) consisting of clayey silts. These soils are saturated and may have been transported by the seepage. One can easily penetrate his foot into the soft seepage zone about eight (8) inches. (Refer to Appendix A, page A-11, Post-Inspection Review of Seepage Zone.)

Ponded seepage water is evident throughout the surface area of the wet zone. This ponded water was observed to gradually drain into the stream channel at several locations. A flow rate of about 3 gpm was estimated at one discharge point. High grass and rock riprap prevented measurement of flow rates at other discharge points.

This seepage zone (left (east) of the stream channel) was identified by Soil Conservation Service personnel as being in the same general area as the seep which developed eight months after filling of the dam reservoir.

c. Appurtenant Structures

1) Principal Spillway Riser. Significant deficiencies were not observed. The 30 in. dia. slide gate was exercised and found operable.

2) Outlet Works. The impact stilling basin is in good condition. There was no evidence of spalling or cracking of exposed concrete surfaces. A 12 in. dia. seepage outlet drain exits from each side wall of the impact basin. Each outlet drain had an estimated 10 gpm clear discharge.

The rock riprap placed on exit channel stream banks shows evidence of advanced weathering. However, these channel banks appear stable at the present time. The downstream channel was observed free of debris and flow obstructions.

3) Emergency Spillway. Spillway channel bottoms and side slopes are vegetated with a dense grass. A shallow footpath extends across the upstream channel bottom and both channel side slopes. Spillway side slopes approximate a 3H:1V inclination and appear stable.

d. Reservoir Area. Visual observations and map review indicate that the immediate reservoir drainage area has gentle to moderate sloping shoreline and slopes. Reservoir shoreline and slopes are predominately covered with woodland and appear stable. No evidence of landslides or significant siltation problems were observed.

e. Downstream Channel. The immediate downstream channel reach is about 10 ft. wide and has stable side slopes. No conditions were observed in the downstream channel that might cause flow obstruction and present hazard to the dam.

Downstream from the dam, Broad Ford Run flows approximately 0.65 miles south where it forms a confluence with the Little Youghiogheny River. Mountain Lake Dam is located in the downstream flood plain, about 0.1 miles upstream of the Little Youghiogheny River-Broad Ford Run confluence. Mountain Lake reservoir was observed drained on the date of the field reconnaissance. The community of Mountain Lake Park and the town of Oakland, Maryland, are respectively located approximately 0.4 miles and 3.5 miles downstream of the dam embankment.

3.2 Evaluation

a. Embankment

1) Surficial. The rill erosion, eroded footpaths, tire ruts, and shallow depression observed on the embankment slopes are surficial deficiencies and are not considered significant. However, remedial repairs should be made as soon as practical.

Additional rock riprap will be required to replace disintegrated limestone riprap exposed above normal pool level on the upstream slope berm. The disintegrating rock riprap berm may not provide sufficient protection against wave erosion.

2) Seepage. The seepage zone located at the toe of the dam is considered to represent a potential hazard to the dam based on the following:

a) Seepage is being ponded in an approximate 4,000 sq. ft. surface area located between 25 and 100 ft. below the toe of the dam.

b) The Soil Conservation Service construction report indicates that a seepage zone developed in this general location about eight months after the reservoir reached its design elevation behind the dam. The observed seepage had an estimated flow rate of 5 gpm.

c) A soil zone of extremely soft consistency was identified within the above ponded surface area. The soil material contained in the zone may have been transported by the seepage.

d) Based on reservoir water level, there is a potential hydraulic head of 27 ft. for normal pool conditions. This could be increased to 37 ft. for design high water pool levels.

e) The total quantity of free flowing water could not be estimated. However, three specific channels flowing from the seepage zone to the stream channel were observed and noted.

f) Forty (40) percent of the upstream embankment slope is below normal pool level and cannot be observed for possible depressed areas.

The cause and origin of the observed seepage could not be conclusively established by visual observation and review of design documents. It is speculated that the seepage may be related to the fault rubble zone underlying the left abutment. However, observation well readings and the observed discharge from seepage drains do not appear to support this. It is recommended a detailed study be made to determine the following:

a) Cause(s) and origin of the seepage condition.

b) Quantity of seepage flow, and fluctuation in flow due to reservoir pool levels or ground water conditions.

c) Quality of seepage (amount of eroded fines contained in seepage flow).

d) Significance of seepage condition to dam stability.

e) Recommendations for remedial measures, as necessary.

b. Appurtenant Structures. The principal and emergency spillways and impact stilling basin appear to be functioning as designed and are considered to be in good condition.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. Reservoir pool level is normally maintained by the uncontrolled weir crest openings of the principal spillway riser. Normal operating procedure does not require a dam tender. The only operational feature of the dam is a mechanical slide gate used to drain or lower the reservoir pool. The slide gate is infrequently operated and is normally closed.

4.2 Maintenance of Dam. The dam facility is maintained by the Mayor and Town Council of Oakland. Park maintenance crews and civic groups provide assistance in the upkeep of the dam embankment and appurtenances. Maintenance reportedly consists of mowing embankment and spillway slopes, applying lime and fertilizer, repairing eroded areas, removing trash, and clearing debris from trash racks.

4.3 Inspection of Dam. The Mayor and Town Council of Oakland are required by the State of Maryland to inspect the dam annually and make needed repairs. Formal inspections have been performed by the Soil Conservation Service at the request of the Mayor and Town Council. Inspections generally consist of visually examining the dam embankment, appurtenant structures, reservoir area, and outlet channel, and providing repair recommendations.

4.4 Maintenance of Operating Facilities. There is no record of how often the slide gate and lifting mechanisms are maintenanced or exercised. The slide gate was found operable on our April 11, 1979, field reconnaissance.

4.5 Warning System. There is no warning system or formal emergency procedure to alert, or evacuate as necessary, downstream residents in the event or threat of a dam failure.

4.6 Evaluation. In general, maintenance and inspection procedures at Little Youghiogheny Site No. 6 are considered to be adequate. However, a formal flood surveillance and warning plan is needed for the protection of downstream residents. In addition, future inspections should be conducted with an emphasis on the seepage/wet zones located at the embankment toe, to determine that conditions are not changing.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features

a. Design Data. Little Youghiogheny Site No. 6 has a watershed drainage area of 4,365 acres vegetated primarily by cropland, woodland, and pasture. The dam impounds a reservoir with a surface area of 138 acres and a normal pool storage volume of 1,410 ac.-ft. Hydrology analyses were based on Soil Conservation Service structure classification "C" criteria ("high" hazard).

The principal spillway weir crest openings were designed to pass the 6 hour, 100-year frequency storm without activating the emergency spillway. Fifty year sediment accumulation (85 ac.-ft.) and beneficial storage of 1,325 ac.-ft. (for water supply and recreation) were used to set the riser crest openings at 16 ft. below the dam crest (El. 2,432.0).

The hydraulic capacity of the emergency spillway channel is reported to be 17,000 cfs when the reservoir pool is level with the dam crest (El. 2,449.0). Spillway capacity was designed to pass a flood corresponding to 22.7 in. of runoff in six hours without overtopping the dam embankment. Top of dam elevation was based on Soil Conservation Service, freeboard hydrograph criteria. (Refer to Appendix C for summary of data.)

As previously indicated, Little Youghiogheny Site No. 6 is classified as an "intermediate" size, "high" hazard dam. According to guideline criteria, the required spillway design flood for the dam facility is the PMF. Soil Conservation Service routing calculations indicate dam storage and emergency spillway capacity is adequate to pass 100% of PMF.

The reviewed Soil Conservation Service hydrological/hydraulic design information is in accordance with accepted engineering practice and is considered to be adequate for the scope of a Phase 1 study.

b. Experience Data. Records are not kept of reservoir level elevations or rainfall amounts. There is no record or report of the emergency spillway ever being activated during periods of heavy rainfall.

c. Visual Observations. On the dates of the field reconnaissances, no evidence of serious deficiencies were observed that would prevent the emergency spillway or principal spillway riser to function as designed.

d. Overtopping Potential. The Corps of Engineers guidelines recommends the Probable Maximum Flood (PMF) for "intermediate" size, "high" hazard dams. Hydrometeorological Report No. 33 indicates the adjusted 6 hour PMF direct rainfall for the subject site area is 21.5 in.

Soil Conservation Service routing calculations indicate dam and spillway are sized to pass a flood corresponding to 22.7 in. of runoff in 6 hours without overtopping the dam crest.

Based on the above data, it is considered unlikely the dam embankment will be overtopped.

e. Emergency Spillway Adequacy. Data, previously developed, indicates that reservoir storage and spillway hydraulic capacity is adequate to pass 100% of the PMF. The dam and spillways are therefore considered adequate and in accordance with recommended criteria.

f. Downstream Conditions. Downstream of the dam, Broad Ford Run empties into the Little Youghiogheny River, just north of Loch Lynn Heights. In this half mile channel reach and flood plain, about eight (8) inhabited structures will be subject to damage and loss of life in the event of a dam failure.

Mountain Lake Dam is located in the downstream flood plain approximately 0.55 miles south of Little Youghiogheny Site No. 6. The Little Youghiogheny River intersects State Routes 41, 5, and 219 before emptying into the Youghiogheny River about 1 mile west of Oakland, Maryland. Substantial property damage and loss of life would likely occur along the southwest residential boundaries of Oakland, if the dam fails.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

1) Embankment. Surficial embankment deficiencies identified in Section 3.1-b(1) are not considered to have a significant effect on dam stability. However, the observed seepage zone located at the toe of the dam is considered to represent a potential hazard to the dam. As previously indicated, the cause and origin of the seepage could not be conclusively established by visual observation. However, since this wet area initially developed with the filling of the reservoir it is believed to be caused by seepage through the embankment or foundation. The observed silt material contained in the seepage zone indicates piping may be in progress. Therefore, further investigation is considered necessary to ascertain the significance of the seepage to dam stability.

2) Appurtenant Structures. Visual observations of the principal and emergency spillways and outlet works did not reveal evidence of structural distress that would significantly affect hydraulic performance or dam stability.

b. Design and Construction Data

1) Subsurface Exploration. The geological and subsurface investigation of the dam site and borrow areas included 19 power auger holes, 59 air rotary drill holes, and 90 test pits. (See Plate Nos. 1, 8, 9, 10, 11, 12, and 13.)

Test boring logs indicate overburden soils deposited at abutment slopes (at dam centerline) consist predominately of residual and alluvial silts and clays containing boulders and cobbles of conglomerate sandstone. This soil deposit extends to shale bedrock (Jennings Formation) and varies in thickness from 2 ft. to about 12 ft. Flood plain soils are described as alluvial and colluvial in origin. These alluvial and colluvial deposits reportedly vary in thickness, and typically consist of 4 to 6 ft. of soft silty clays underlain by gravels, sands, and cobbles to an average depth of 13 ft. where soft shale bedrock is encountered.

Ground water levels encountered in flood plain drill holes and test pits averaged 1 ft. below ground surface. Artesian pressure was encountered in numerous drill holes with heads measuring from 1 to about 5 ft. above ground surface at 3 drill holes. Artesian flows varied from about 2 gpm to a maximum of 5 gpm according to estimates in the drill logs. (Refer to Regional Geology, Appendix F for additional geological and geohydrology information.)

2) In-Situ Testing. Constant head field permeability tests and pressure tests were performed in overburdened soils and foundation bedrock. Results indicate the overburden soils are of low permeability (0-2 ft./day). However, the fault rubble zone was found to have a permeability rate in excess of 100 cubic ft./day/sq. ft. of cross section. The overall expected seepage flow through the fault rubble zone (untreated) was estimated as 656,000 gallons per day (450 gpm), as computed by the Darcy Short Path Method. Permeable zones in the bedrock foundation were also encountered in areas apart from the fault zone (drill holes No. 18 and 21). A cutoff trench and grout curtain were constructed to reduce seepage flow and reduce the potential risk of piping developing in the dam foundation. (See Plate Nos. 2 and 5.)

3) Laboratory Testing. Classification, compacted dry density, and shear strength tests were performed on selected samples of foundation and borrow soils. The soil samples were obtained from split spoon and shelby tube samplers and test pit excavations.

Consolidated undrained triaxial tests were performed on residual silty clay soils obtained from emergency spillway excavation and borrow areas. Triaxial specimens were compacted to 95% of Standard Proctor density and yielded averaged shear strength parameters of $\phi = 28^0$, c = 500 psf (unsoaked), $\bar{\phi} = 28^0$, $\bar{c}$ = 490 psf (unsoaked), and $\phi = 15^0$, c = 900 psf (soaked).

4) Slope Stability Analysis. Slope stability of upstream and downstream embankments was evaluated at Sta. 11+75 (maximum section) using the Swedish Circular Arc Method. The analyses considered a 48 ft. high homogeneous embankment with 3H:1V side slopes overlying a bedrock foundation. The lowest factor of safety against shear failure was reported to be 1.63 for the rapid drawdown condition of the upstream slope, and 1.71 for the steady-state seepage condition of the downstream slope. The steady-state phreatic surface used in this analysis sloped from the emergency spillway crest level (10 ft. below dam crest) to 12 ft. above the embankment toe (36 ft. below dam crest).

5) Seepage Analysis. No calculations or references were found in the design report to indicate seepage analyses were performed.

6) Stability Against Piping. Embankment soils were evaluated for stability against piping using filter criteria from Navdocks DM-7. The study indicated the embankment core soils are stable against piping into embankment shell soils.

7) Observation Wells. Four (4) observation wells are installed in the upstream and downstream embankment slopes for the purpose of monitoring the effectiveness of the cutoff trench and grout curtain. The observation wells extend into the shale and sandstone bedrock on the right and left sides of the fault zone located at the left (east) embankment abutment. Observation well readings indicate a drop in hydraulic head in the shale and sandstone bedrock of about 10 and 15 ft., respectively, across the grout curtain. Observation well readings also indicate a gradual rise in hydraulic head of the shale bedrock located upstream of the grout curtain.

8) Site History. Construction report for Little Youghiogheny Site No. 6 indicates the development of a seepage zone at the downstream abutment-flood plain junction within eight (8) months after the filling of the reservoir. The observed seepage zone extended about 30 ft. to 100 ft. downstream of the dam on the left (east) side of the exit stream channel. This zone reportedly had an estimated seepage flow rate of 5 gpm.

c. Operating Records. Operating records are not maintained at the dam facility. However, the structural stability of the dam embankment and appurtenant structures is not considered to be affected by the operation of the slide gate.

d. Post-Construction Changes. Two (2) years after the dam was constructed, a water supply pipeline was installed across the entire length of the dam crest and width of the upstream emergency spillway channel. (Refer to Section 1.2-g.) This post-construction addition to the dam embankment is not considered to have a significant effect on dam stability, provided major leaks do not develop in the pipeline.

e. Seismic Stability. Based on available static slope stability data, visual observations, and the past performance history of the dam, the static stability of the embankment slopes is considered to be adequate.

According to guideline criteria, Little Youghiogheny Site No. 6 is located in a Seismic Zone 1 area (low seismic probability). Based on this low seismic probability and recommended criteria for the evaluation of seismic stability of dams, the seismic stability of the dam structure is presumed to be adequate under these earthquake conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation

1) Embankment. Visual observations indicate Little Youghiogheny Site No. 6 is in fair condition. This fair condition classification is specifically based on the visual observation of a seepage zone located at the toe of the dam at the left (east) side of the exit stream channel. The cause and origin of the seepage is not known with certainty. It is believed the seepage condition may represent a potential hazard to the dam. Since this wet area left of the stream channel initially developed with the filling of the reservoir it is believed to be caused by seepage through the embankment or foundation. The observed silt material contained in the seepage zone indicates piping may be in progress. Therefore, further investigation is considered necessary to ascertain the significance of the seepage to dam stability.

2) Appurtenant Structures. Based on a review of available design documents, as-built drawings, and visual observations of conditions as they existed on the dates of the field reconnaissances, the structural performance and condition of the principal and emergency spillways and impact stilling basin are assessed good.

3) Flood Discharge Capacity. The hydrological/hydraulic computations reviewed in this study indicate the dam can pass the PMF (100%), the required spillway design flood, without overtopping the dam embankment. Therefore, the spillway system is considered adequate and in accordance with recommended guideline criteria.

b. Adequacy of Information. The design information and drawings available for this review were of sufficient detail to adequately conduct a Phase 1 study.

c. Necessity for Further Investigation. As previously indicated, the cause and origin of the seepage identified in Section 3.1-b(2) is not known with certainty. This wet area reportedly initially developed with the filling of the reservoir and may be the result of seepage through the embankment or foundation. Further investigation, as recommended in Section 7.2, is considered necessary to ascertain the significance of the seepage to dam stability.

The scope of the recommended study is beyond the intended scope of a Phase 1 investigation.

d. Urgency. The study recommended in Section 7.2 should be implemented immediately. Remedial repairs recommended to correct surficial embankment deficiencies should be performed as soon as possible.

7.2 Recommendations/Remedial Measures. The following recommendations are presented based on the data obtained.

a. Dam and Appurtenant Structures

1) Implement study to evaluate and ascertain the significance of seepage zone located at toe of dam. Study should determine the following:

a) Cause(s) and origin of the seepage condition.

b) Quantity of seepage flow, and fluctuation in flow due to reservoir pool levels or ground water conditions.

c) Quality of seepage (amount of eroded fines contained in seepage flow).

d) Significance of seepage condition to dam stability.

e) Recommendations for remedial measures, as necessary.

This study should be performed by a professional geotechnical engineer, experienced in the design and inspection of earthfill dams.

2) Place additional (suitable) rock riprap on the upstream slope berm above normal pool level.

3) Repair surficial rill and footpath erosion on embankment slopes and upstream emergency spillway channel. Backfill and resod tire ruts on the embankment crest and embankment-spillway abutment.

b. Operation and Maintenance Procedures

1) Develop a formal flood surveillance and warning plan. Plan to include, but not limited to, the following:

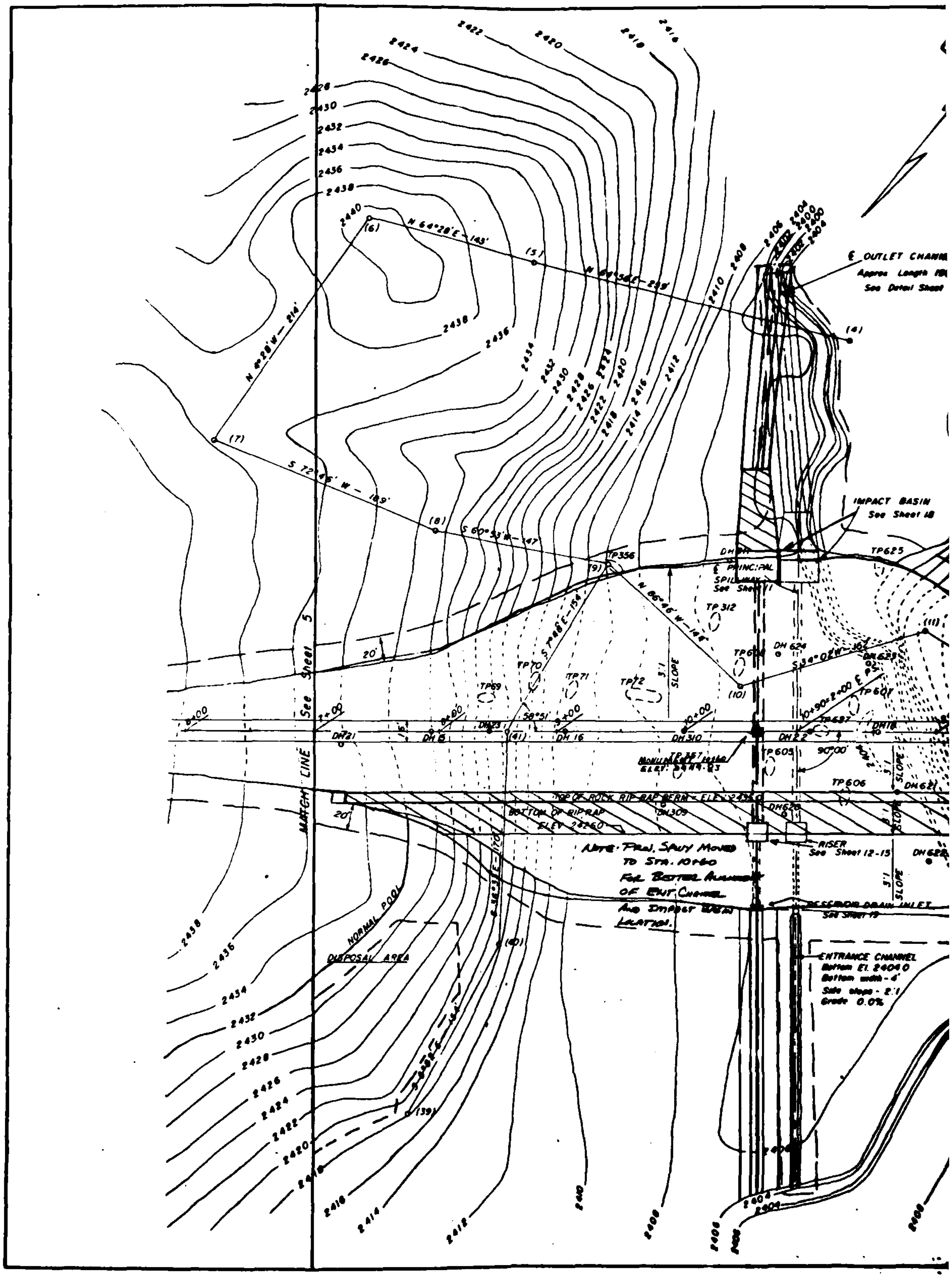
a) Surveillance. Around-the-clock surveillance of the dam embankment, reservoir and tailwater pool levels, and spillway channels during periods of unusually heavy rainfall.

b) Warning System. Formal warning procedures to alert downstream residents in the event of expected high flood flows.

c) Evacuation Plans. Adequate emergency contingency plans to evacuate downstream residents in the event or threat of a dam failure.

2) Periodically observe wet zone located right (west) of impact stilling basin and exit stream channel for an increase in surface area or the development of a seepage condition.

PLATES



OUTLET CHANNEL
IMPACT BASIN
See Sheet 18
PRINCIPAL SPILLWAY
See Sheet 11
MATCH LINE
See Sheet 5
TOP OF ROCK RIP RAP BERM - ELEV. 2436.0
BOTTOM OF RIP RAP
ELEV. 2426.0
RISER
See Sheet 12-15
NOTE: PRIN. SPWY MOVED
TO STA. 10+60
FOR BETTER ALIGNMENT
OF EXIT CHANNEL
AND IMPACT BASIN
LOCATION.
NORMAL POOL
DISPOSAL AREA
ENTRANCE CHANNEL
Bottom El. 2404.0
Bottom width - 4'
Side slopes - 2:1
Grade 0.0%
3:1 SLOPE

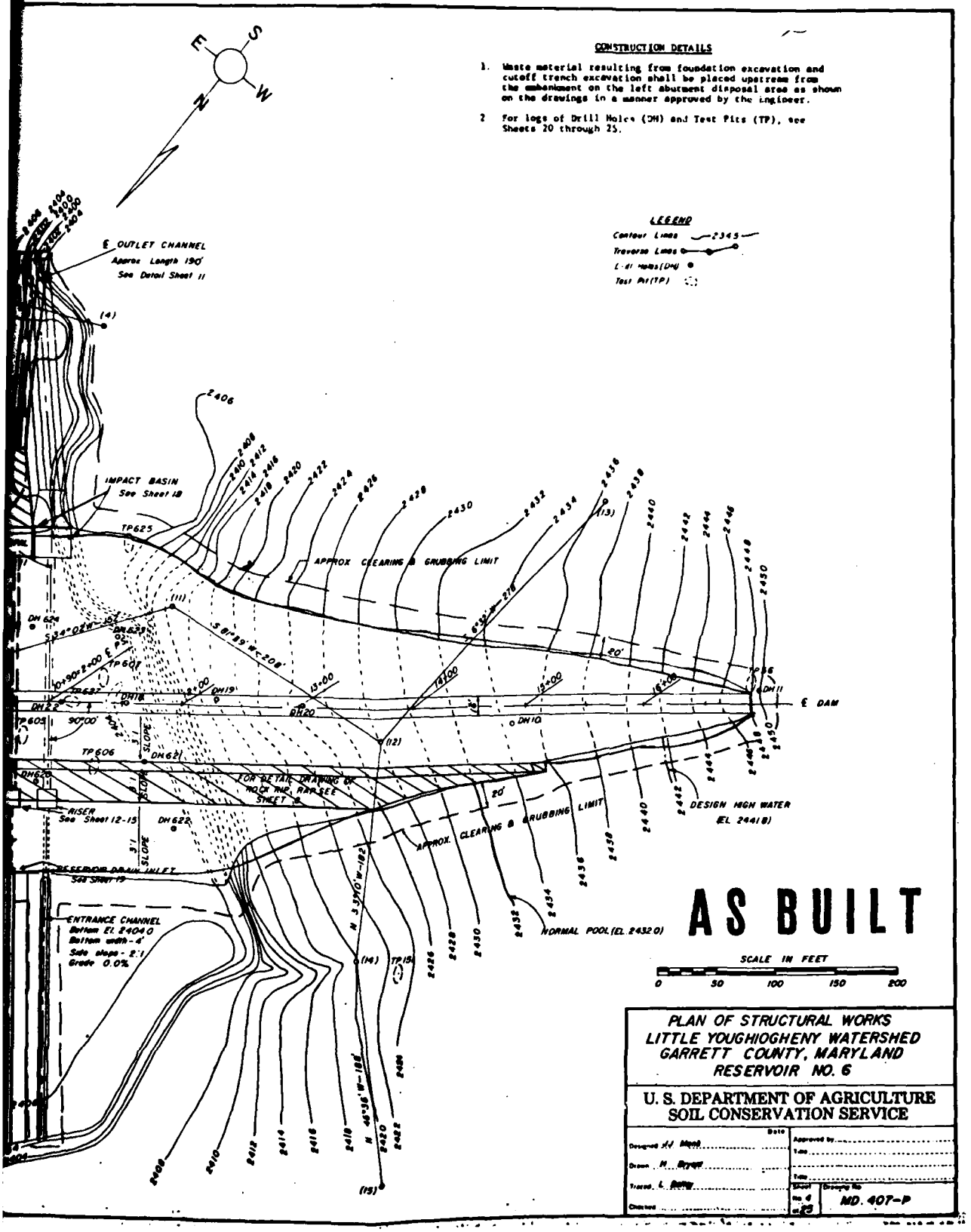
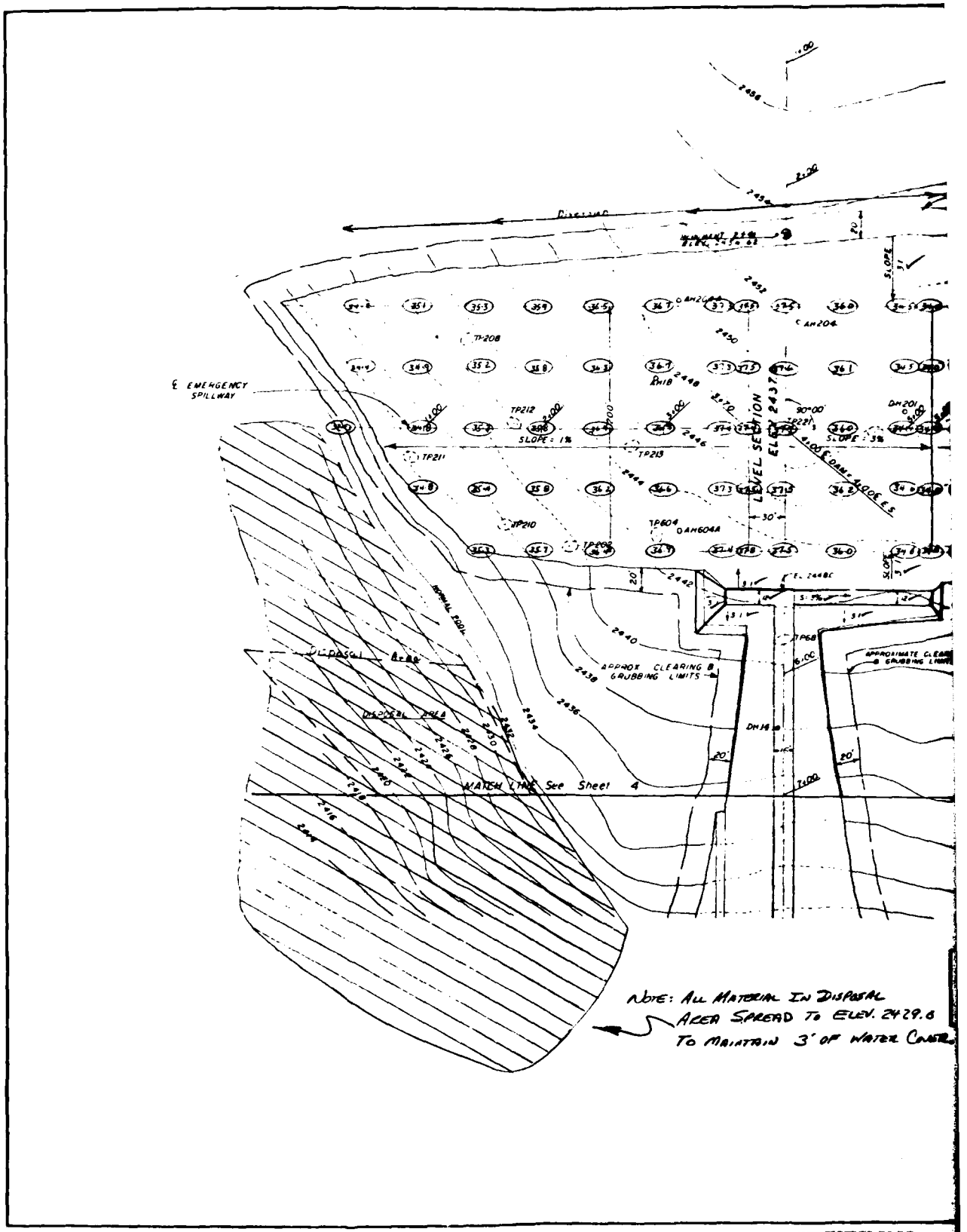
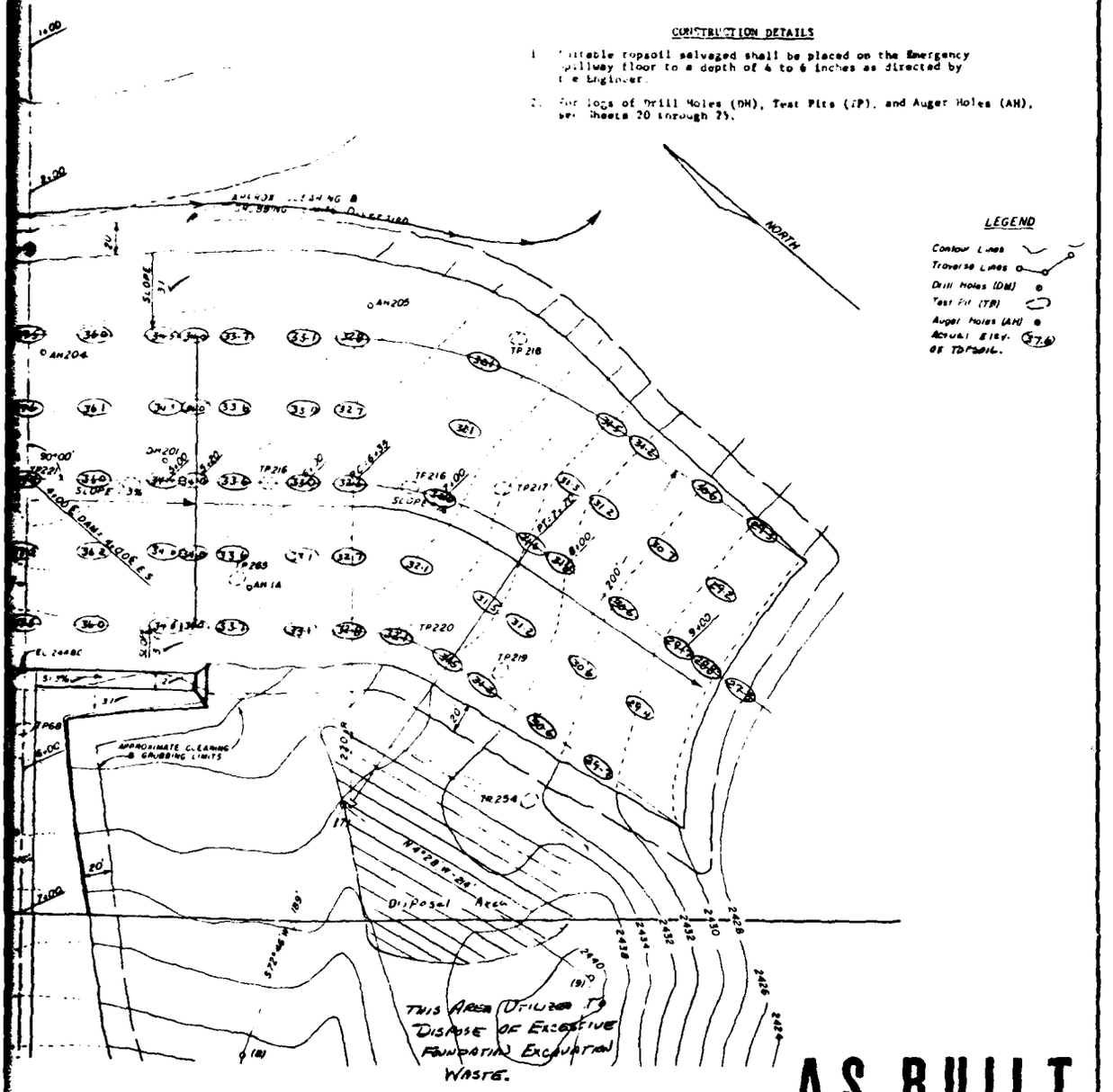

CONSTRUCTION DETAILS
1. Waste material resulting from foundation excavation and cutoff trench excavation shall be placed upstream from the embankment on the left abutment disposal area as shown on the drawings in a manner approved by the Engineer.
2 For logs of Drill Holes (DH) and Test Pits (TP), see Sheets 20 through 25.
LEGEND
Contour Lines 2345
Traverse Lines
Drill Holes (DH)
Test Pit (TP)
E OUTLET CHANNEL
Approx Length 190'
See Detail Sheet 11
IMPACT BASIN
See Sheet 18
APPROX CLEARING & GRUBBING LIMIT
E DAM
DESIGN HIGH WATER
(EL 2441.8)
FOR DETAIL DRAWING OF ROCK RIP RAP SEE SHEET 18
RISER
See Sheet 12-15
RESERVOIR DRAIN INLET
See Sheet 19
ENTRANCE CHANNEL
Bottom El. 2404.0
Bottom width - 4'
Side slope - 2:1
Grade 0.0%
NORMAL POOL (EL. 2432.0)
AS BUILT
SCALE IN FEET
0 50 100 150 200
PLAN OF STRUCTURAL WORKS
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Date
Designed J.J. Mead
Drawn M. Bryer
Traced L. Bailey
Checked
Approved by
Title
Title
Sheet no. 4 of 29
Drawing No. MD. 407-P

PLATE NO. 1


E EMERGENCY SPILLWAY
TP208
TP212
TP211
TP213
TP210
TP604
DAM604A
DAM204
DH201
DH19
SLOPE = 1%
SLOPE 3%
LEVEL SECTION EL. 2437
NORMAL POOL
APPROX CLEARING & GRUBBING LIMITS
DISPOSAL AREA
MATCH LINE See Sheet 4
Note: ALL MATERIAL IN DISPOSAL AREA SPREAD TO ELEV. 2429.6 TO MAINTAIN 3' OF WATER COVER

CONSTRUCTION DETAILS

1. Suitable topsoil salvaged shall be placed on the Emergency Spillway floor to a depth of 4 to 6 inches as directed by the Engineer.
2. For logs of Drill Holes (DH), Test Pits (TP), and Auger Holes (AH), see Sheets 20 through 25.



EMERGENCY SPILLWAY CURVE DATA	
Δ = 35°30'	T = 69.72'
R = 220'	E = 10.78
D = 26°08'	LC = 132.92'
L = 139.00'	M = 10.28'

IN DISPOSAL
D TO ELEV. 2429.6
3' OF WATER COVER.

AS BUILT

SCALE IN FEET
0 50 100 150 200

PLAN OF STRUCTURAL WORKS
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

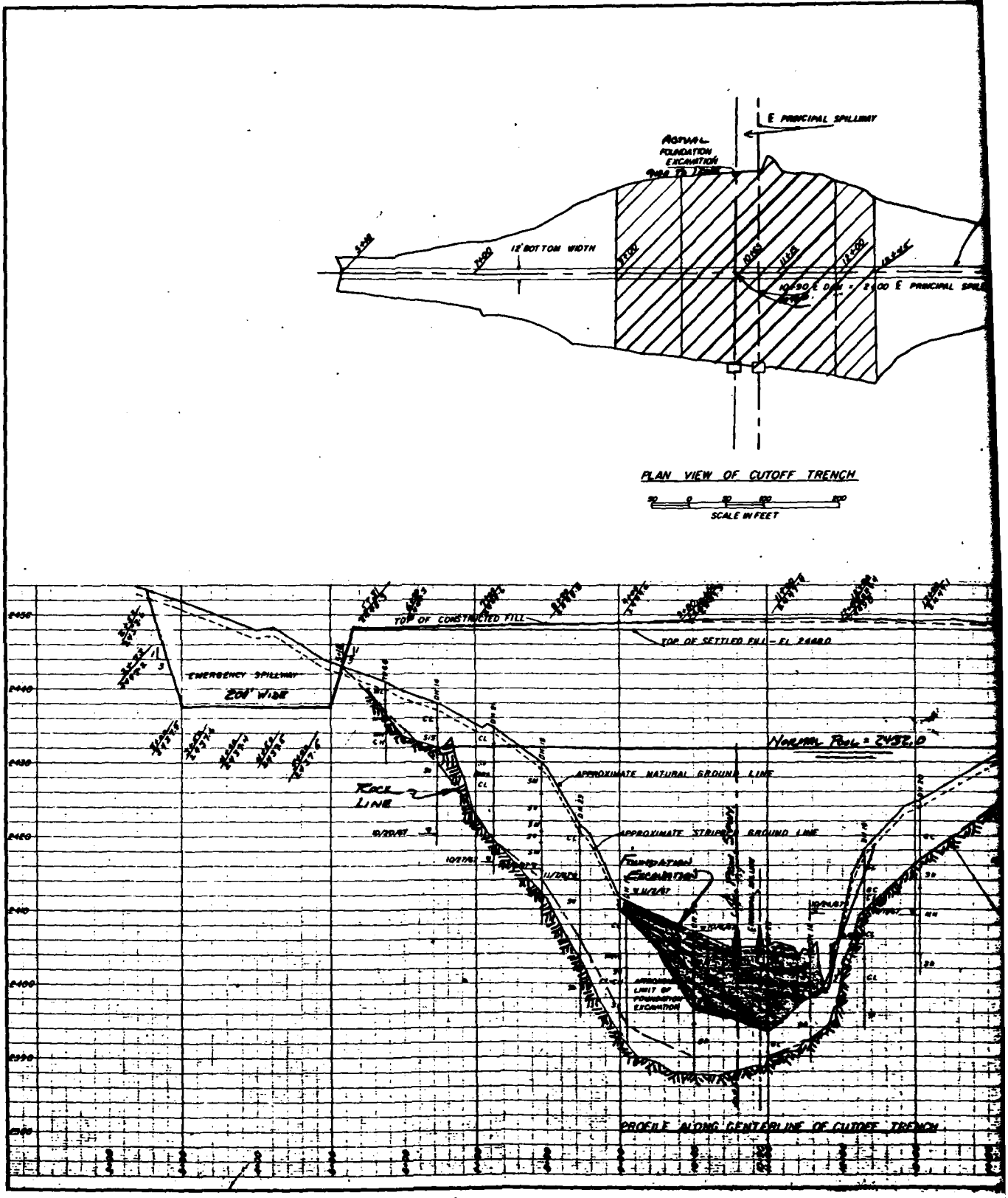
Designed JJ Mack	Date	Approved by	
Drawn H Bryant		Title	
Traced J. MacGowan		Title	
As Built 1972		Sheet No. 5 of 25 sheets	Drawing No. MD. 407-P
Checked W. Patsel, R. Veasiack			

SCS-313 (9-64)

PLATE NO. 1A

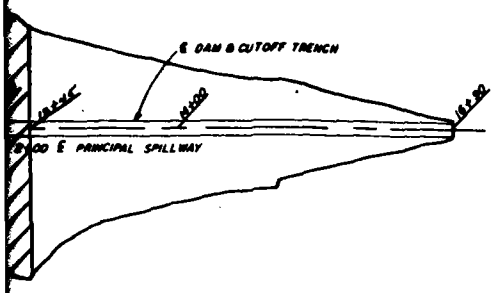
1

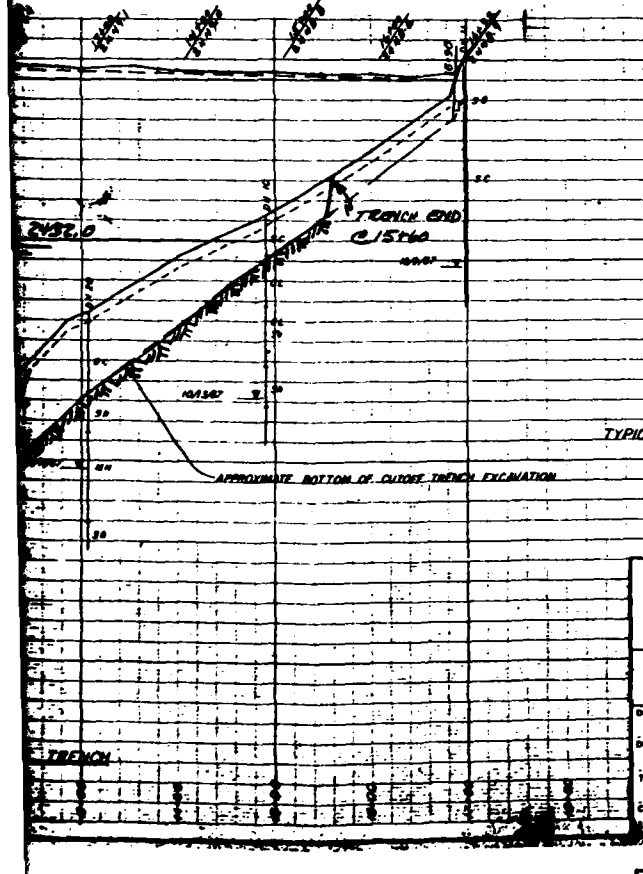
2

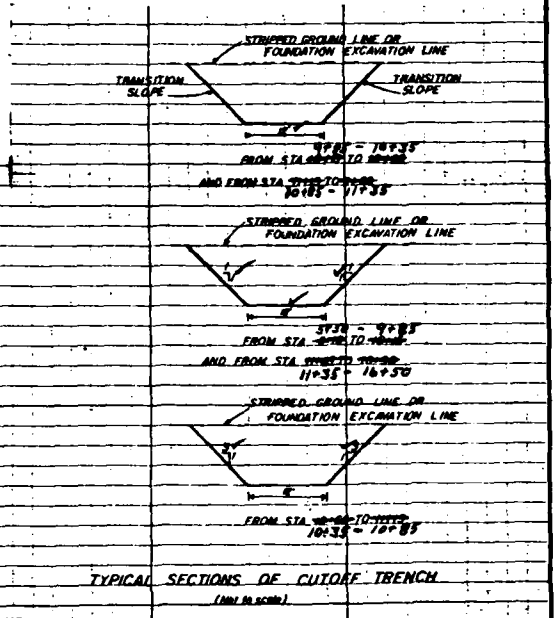

E PRINCIPAL SPILLWAY
ASPHALT FOUNDATION EXCAVATION
12' BOTTOM WIDTH
PLAN VIEW OF CUTOFF TRENCH
SCALE IN FEET
TOP OF CONSTRUCTED FILL
TOP OF SETTLED FILL - EL 2448.0
EMERGENCY SPILLWAY
200' WIDE
NORMAL POOL = 2432.0
APPROXIMATE NATURAL GROUND LINE
ROCK LINE
FOUNDATION EXCAVATION
PROFILE ALONG CENTERLINE OF CUTOFF TRENCH

CONSTRUCTION DETAILS

1. The profiles of the bottom of all excavations shown are approximate.
2. Required finished grades will be established by the Engineer.
3. Cutoff trench backfill shall consist of the material designated for Zone I as shown on Sheet 8.
4. No backfill shall be placed on slopes steeper than 1:1.
5. Backfill shall be placed in the cutoff trench only in the presence of the Engineer.
6. For descriptions of logs of drill holes and test pits, see Sheets 20 through 25.







TYPICAL SECTIONS OF CUTOFF TRENCH
(Not to scale)

AS BUILT

CUTOFF TRENCH DETAILS
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

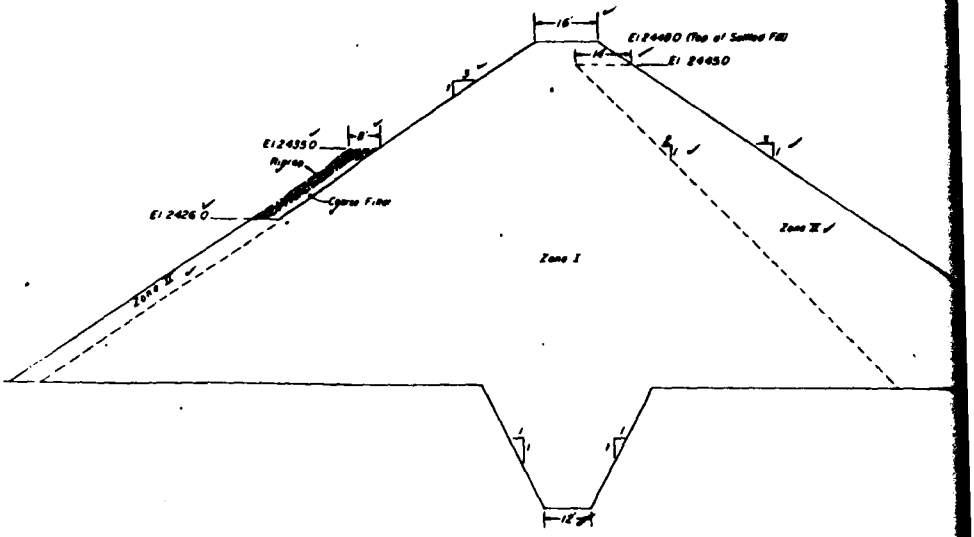
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
A.J. Mast		Title
Drawn J.J. Mast		Title
Traced		
Checked J.N. Bailey	Sheet No. 7 of 25	Drawing No. MD. 407-P

PLATE NO. 2

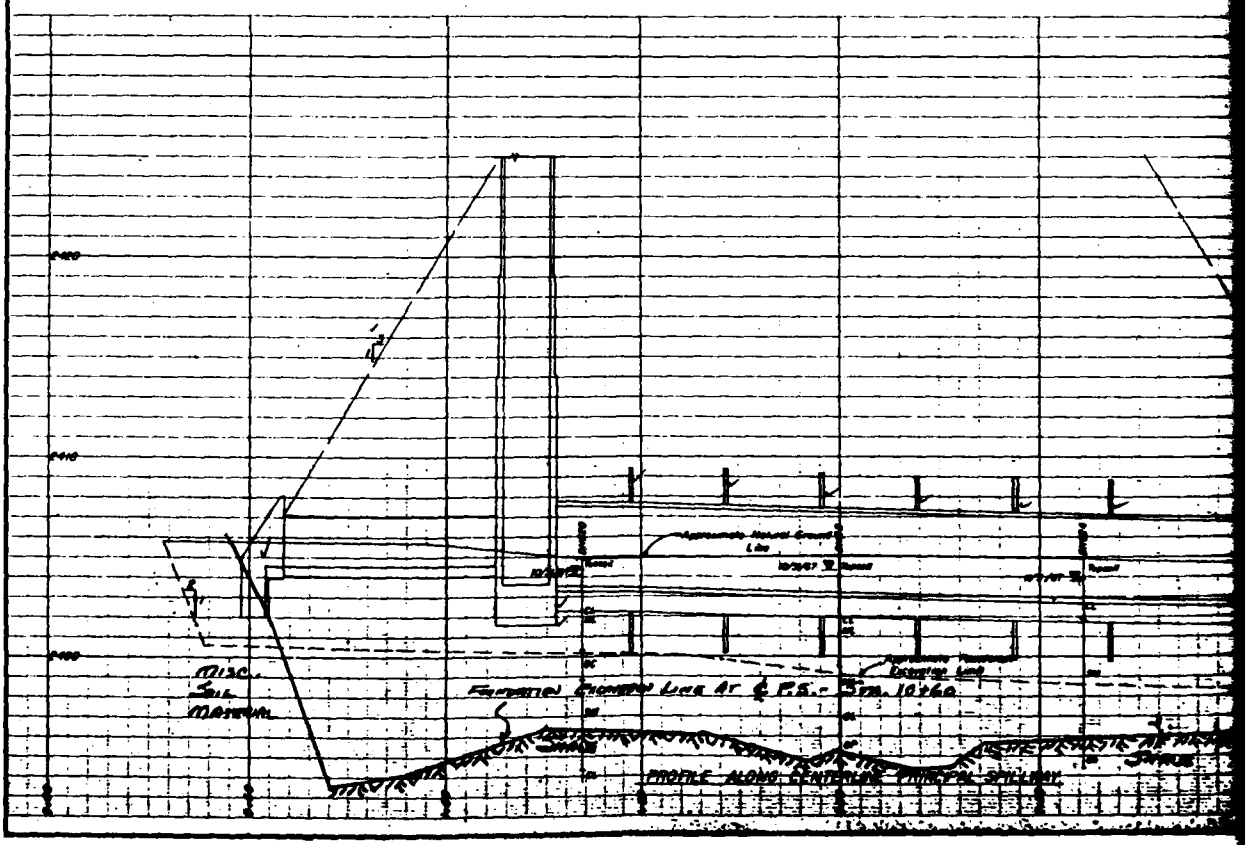
1

2



TYPICAL SECTION OF EMBANKMENT

Not to Scale



CONSTRUCTION DETAILS

1. Earth Fill - Zone I

   A. This zone shall consist of materials obtained from the Emergency Spillway and Borrow Area.

      1. CL-ML material as represented by:
         TP 220 (1.0' to 3.5')
         TP 152 (3.6' to 10.7')

      2. CL material as represented by:
         TP 220 (3.5' to 8.5')

      3. ML material as represented by:
         TP 154 (0.5' to 6.5')
         TP 157 (0.7' to 2.5')

   B. Compaction shall be Class A. The fill matrix shall be compacted to no less than 95% of the maximum density obtained in compaction tests of the fill materials performed in accordance with Method A, ASTM Designation D-698.

   C. The moisture content of the fill matrix shall be no more than 1% below or 2% above optimum moisture content.

   D. The maximum size of rock fragments that shall be incorporated in the fill is six (6) inches.

   E. The maximum thickness of the layers of fill material before compaction shall be nine (9) inches.

2. Earth Fill - Zone II

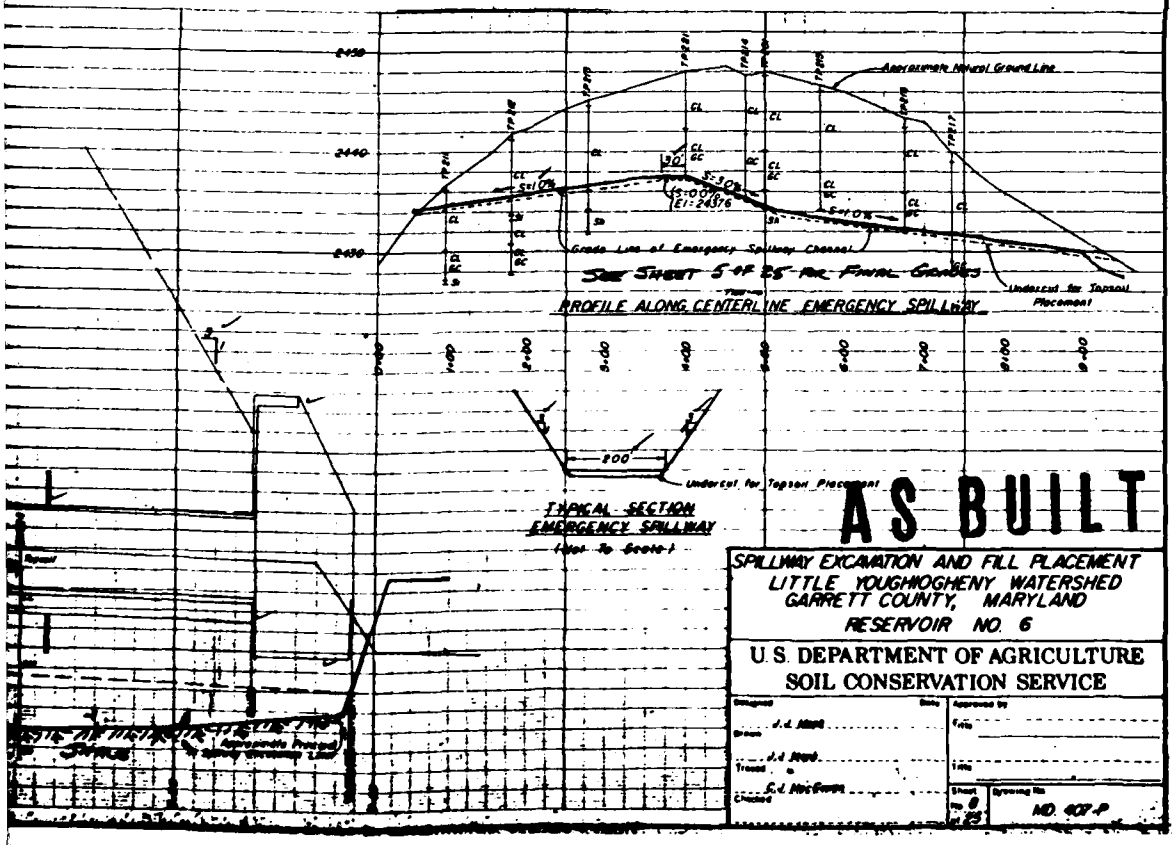
   A. This zone shall consist of materials obtained from the Emergency Spillway and Borrow Area, such as the GC-GM material as represented by TP 220 (8.5' to 12.5') and TP 157 (2.5' to 10'). It may also include oversized rock fragments that have been removed from Zone 1.

   B. The maximum size of rock fragments shall be twelve (12) inches. The maximum thickness of layers of fill materials berore compaction shall be eighteen (18) inches.

   C. Compaction shall be Class C. A minimum of four (4) passes per layer of fill of a pneumatic tired roller weighing at least fifty (50) tons (static service weight) shall be required.

   D. Rock fragments exceeding the maximum size shall be removed from the embankment and disposed in locations as directed by the engineer.

   E. The moisture content of the fill material shall be maintained within the limits required to: (a) prevent bulking or dilatance of the material under the action of the hauling or compacting equipment; (b) prevent the adherence of the fill material to the treads and tracks of the equipment; and (c) insure the crushing and blending of the soil clods and aggregations into a reasonably homogeneous mass.



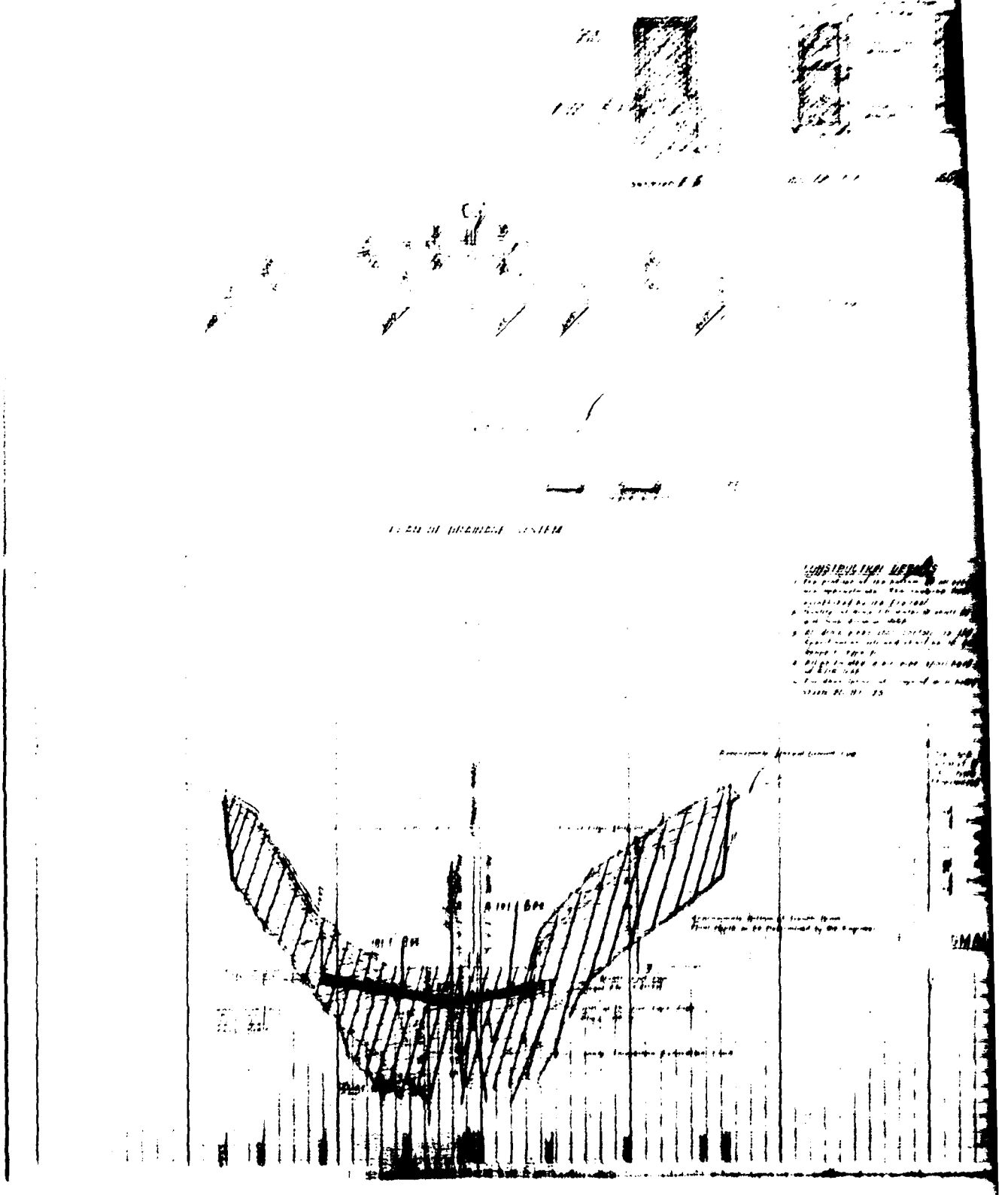
AS BUILT

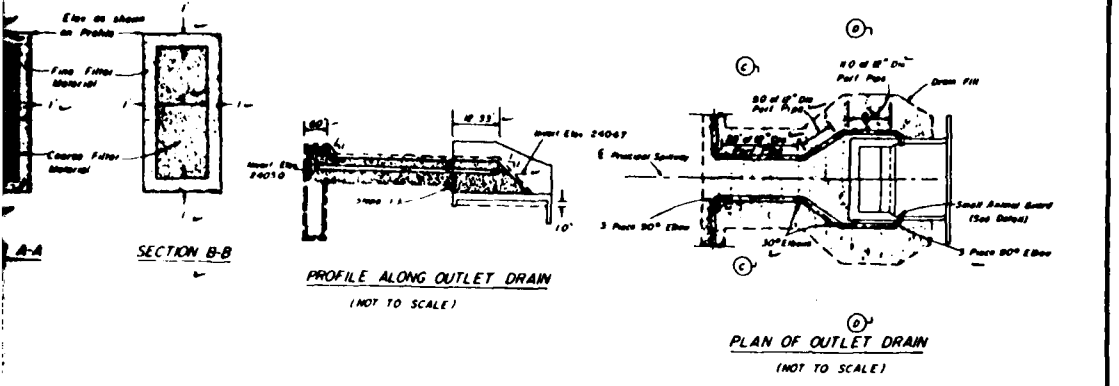
SPILLWAY EXCAVATION AND FILL PLACEMENT
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed — Date — Approved by
Drawn J.A. Hood — Title
Traced J.A. Hood — Title
Checked E.A. MacEwen — Sheet No. 6 of 25 — Drawing No. MD. 407-P

PLATE NO. 3



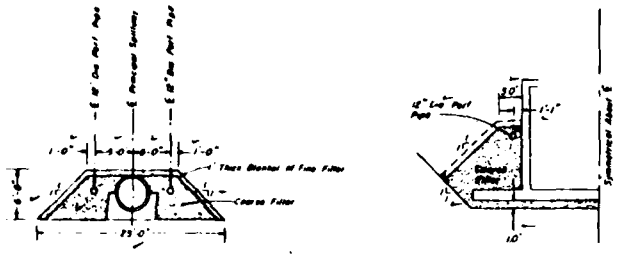


A-A

SECTION B-B

PROFILE ALONG OUTLET DRAIN
(NOT TO SCALE)

PLAN OF OUTLET DRAIN
(NOT TO SCALE)



SECTION C-C
(NOT TO SCALE)

SECTION D-D
(NOT TO SCALE)

QUANTITY SUMMARY

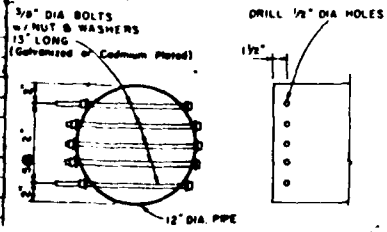
380'- 12" Dia Perf Pipe
4 - 3 Piece 90° Elbows, 12" Dia
4 - 30° Elbows, 12" Dia
2 - Metal End Caps
1260 c.y. Coarse Filter Mat
870 c.y. Fine Filter Mat

SECTION DETAILS

...one of the bottom 10 of excavation as shown ...Prior required finish grades will be ...ed by the Engineer. ...d drain fill material shall be in accordance ...Section 1056 - ...pipes shall conform to the provisions of ...tion 40 and shall be 16 gauge, Class I. ...Type D ...Perforated drain pipe shall have hole diameters ...inch ...Number of rows of drain holes and test pits, see ...Sheet 29

DESIGN DATA FOR DRAIN FILL MATERIAL

Actual	FINE FILTER		COARSE FILTER		Actual
% Passing	Sieve No	% Passing	Sieve No	% Passing	% Passing
100	1/2"	100	3"	100	100
95	4	90 - 100	1"	74 - 100	97
82	8	79 - 100	3/8"	40 - 89	42
54	20	32 - 89	4	6 - 74	15
27	40	26 - 88	8	0 - 53	13
9	60	4 - 49	20	0 - 11	0.8
4	100	0 - 29	40	0 - 5	0.5
3	200	0 - 3			



SMALL ANIMAL GUARD DETAILS
(NOT TO SCALE)
(2 REQUIRED)

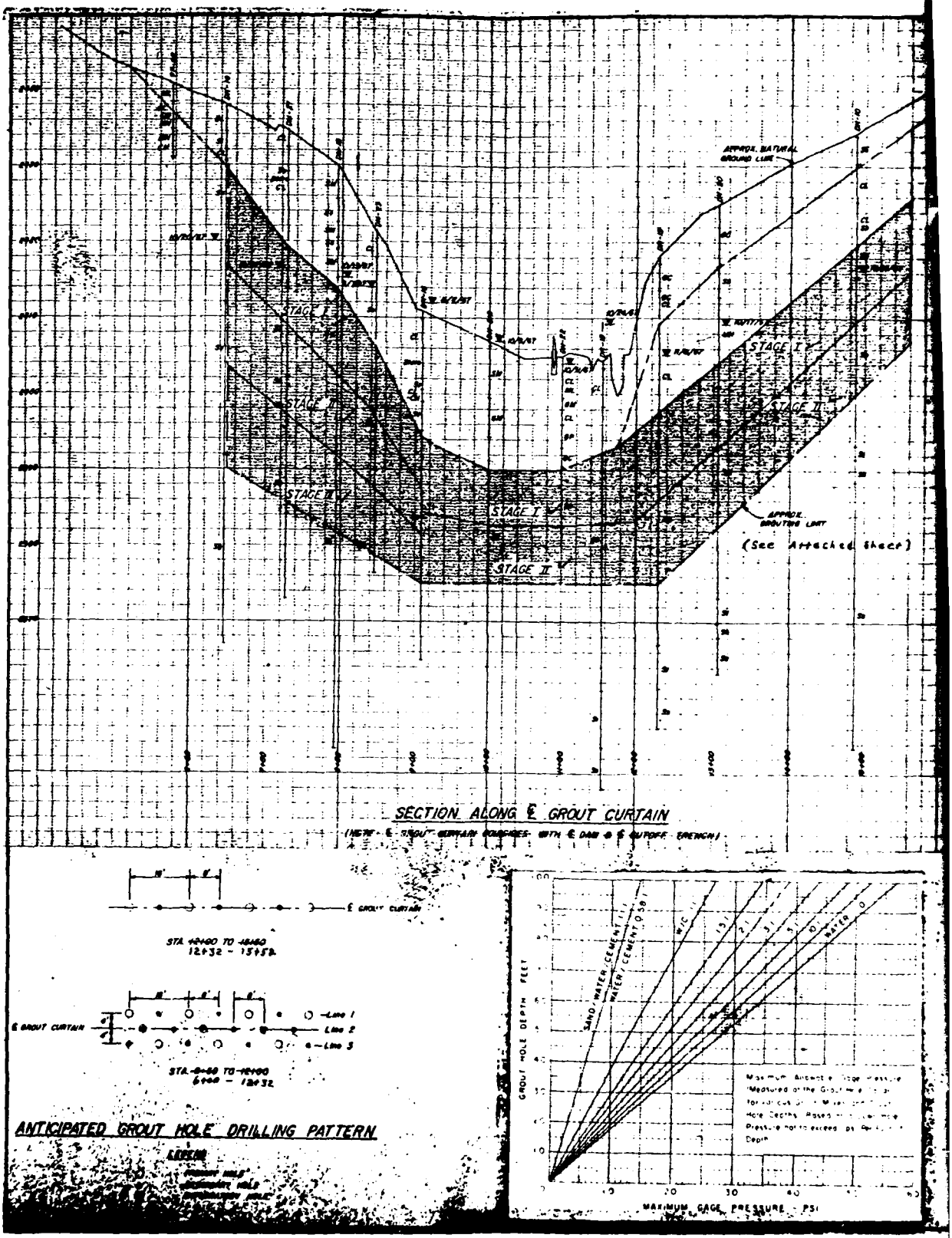
AS BUILT

TRENCH DRAIN DETAILS
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed ... Date ... Approved by ...
Drawn ... Title ...
Traced ... Title ...
Checked ... Sheet ... Drawing No. MD. 407-P

PLATE NO. 4

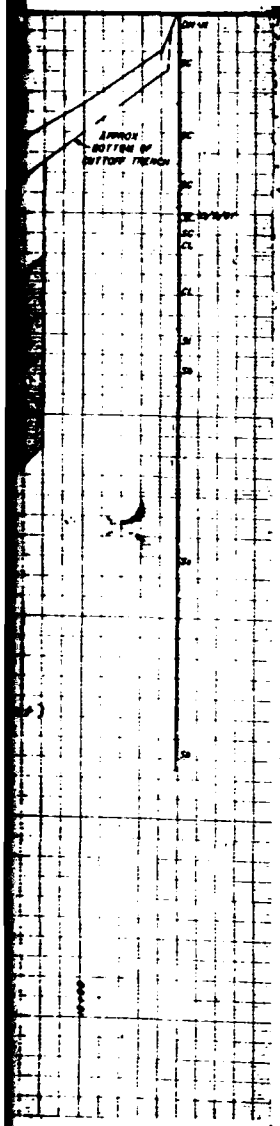


SECTION ALONG ℄ GROUT CURTAIN

(NOTE: ℄ GROUT CURTAIN COINCIDES WITH ℄ DAM @ ℄ CUTOFF TRENCH)

ANTICIPATED GROUT HOLE DRILLING PATTERN

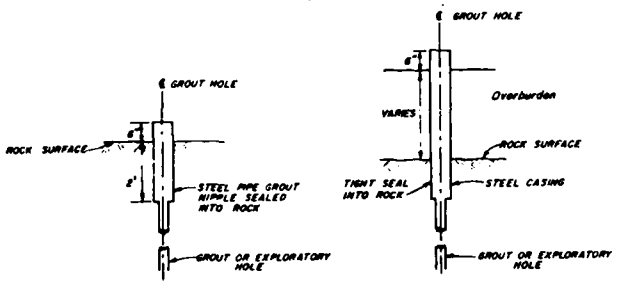
KEY:



CONSTRUCTION DETAILS

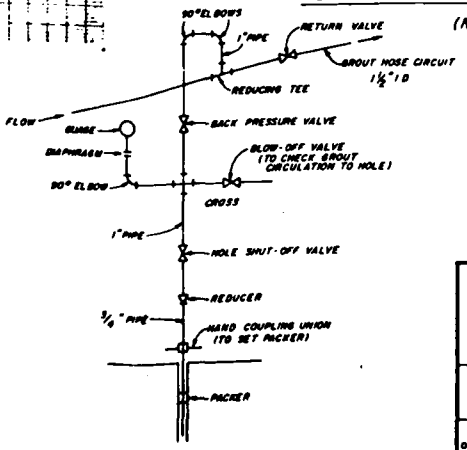
1. The limits of the grout curtain shown are approximate and will be adjusted in accordance with the conditions encountered.
2. In general, the grout curtain will be subdivided into sections not more than 100 feet in length. Grouting operations in the section in the vicinity of the principal spillway conduit shall be completed prior to installation of the principal spillway conduit.
3. In general, stage grouting will be used to establish the grout curtain.
4. Maximum grouting pressure required will not exceed 50 psi at the collar of the hole.
5. The use of non-coring bits will be permitted for drilling grout holes, as directed by the Engineer.
6. Cement used in grout shall be Type II.
7. Drilling grout holes will be done by the split spacing method. All drilling and grouting in each section shall be accomplished in lines 1 and 3 before any drilling and grouting is done on line 2. The need for grouting on line 2 will be determined by the Engineer based on the results of pressure tests and grout take in designated primary holes on line 2.

   Drilled holes in advance of a hole being grouted shall be limited to two holes within a section or separated from a hole being grouted by a distance of 50 feet.
8. Second stage grouting may proceed after the first stage grout, within a distance of 50 feet of the hole to be grouted, has set for a period not less than 24 hours.
9. See sheets 20 through 25 for logs of drill holes and test pits.



TYPICAL NIPPLE OR CASING SETTING FOR GROUT OR EXPLORATORY HOLE

(Not To Scale)



TYPICAL HEADER ARRANGEMENT

AS BUILT

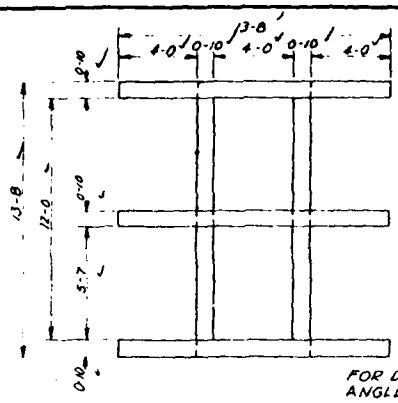
Revised: January, 1970

GROUTING DETAILS
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

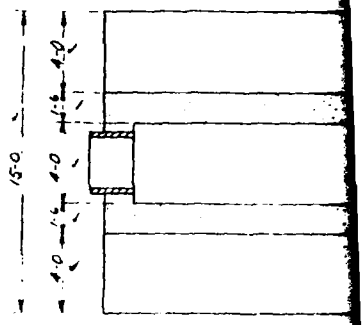
	Date	
Designed J. C. COTTON		Approved by
Drawn J. J. MAINE		Title
Traced		Title
Checked		Sheet No. 10 of 89
		Drawing No. MD 407-P

PLATE NO.5



FOR DETAIL OF TRASHRACK ANGLES AND GRATING SEE SHEET 16

TOP PLAN



SECTION A-A

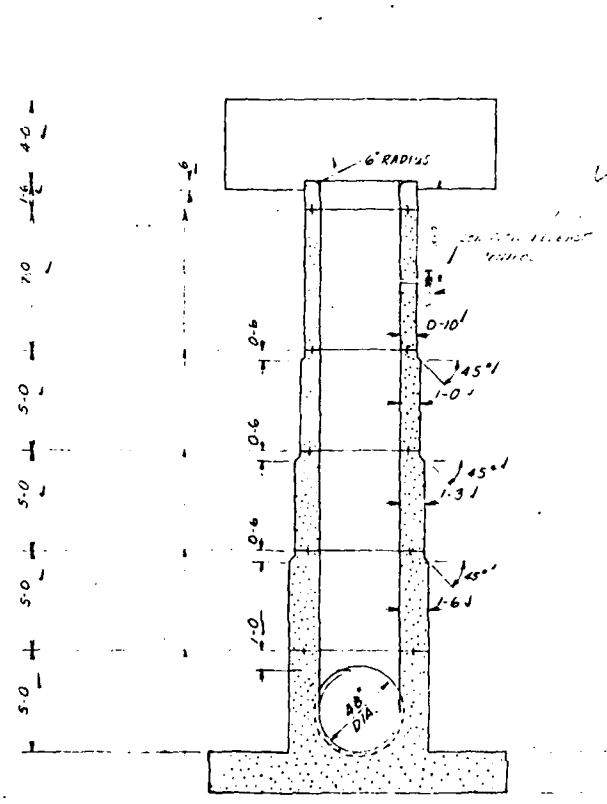
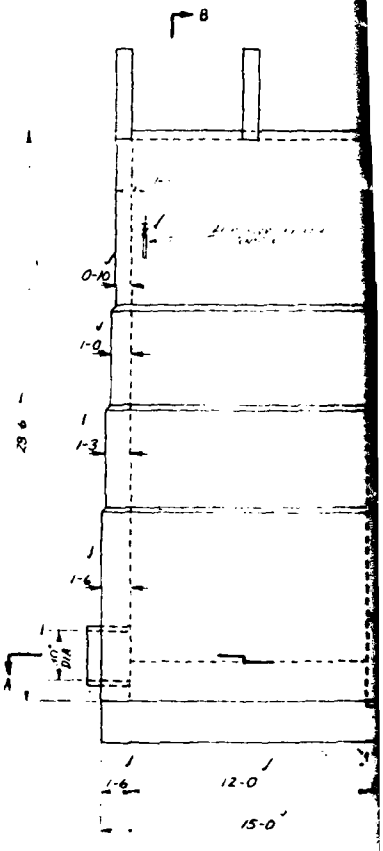


PLATE CONSTRUCTION JOINT, FOR DETAIL SEE SHEET 16

SECTION B-B



SIDEWALL ELEVATION

CONSTRUCTION DETAILS FOR ALL CONCRETE

1. All Concrete Shall Be Class 4000
2. Portland Cement Type I A or Type I with Air-Entraining Admixture Shall Be Used
3. All Reinforcing Steel Placed in Concrete Poured Against the Ground Shall Have A Minimum of 3" Clear Cover. Where Forms are Used Bars Shall Have A Minimum of 2" Clear Cover.
4. All Exposed Edges of Contrete to Have A 3/4" Chamfer Unless Otherwise Specified.
5. Class 2 Aggregate Shall Be Size 57, Spec. 101.

0 2 4 8
SCALE IN FEET

STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B1	#	15	14-8	1	—	—	220-0
B2	6	15	14-8	1	—	—	220-0
B3	8	58	12-10	21	4-6	8-4	744-4
B4	6	15	14-8	1	—	—	220-0
B5	6	15	14-8	1	—	—	220-0
B6	6	26	9-4	21	1-0	8-4	242-8
B7	6	10	9-4	21	1-0	8-4	93-4
B8	6	4	3-4	21	1-0	2-4	13-4
B9	6	4	3-7	21	1-0	2-7	14-4
B10	7	14	13-0	1	—	—	182-0
B11	6	4	5-0	1	—	—	20-0
B12	6	10	12-8	21	4-4	8-4	126-8
B13	6	2	11-0	21	2-8	8-4	22-0
B14	6	4	10-6	21	2-2	8-4	42-0
B15	6	10	10-2	21	1-10	8-4	101-8
B16	6	4	9-8	21	1-4	8-4	38-8
B17	6	8	9-5	21	1-1	8-4	75-4
B18	6	2	11-2	21	2-10	8-4	22-4
B19	6	4	2-7	1	—	—	10-4
B20	6	4	2-7	1	—	—	11-0
B21	6	6	3-2	1	—	—	19-0
B22	6	8	3-6	1	—	—	28-0
R1	6	26	11-7	1	—	—	301-2
R2	6	8	11-7	1	—	—	92-8
R3	7	14	13-0	1	—	—	182-0
R4	6	10	5-0	1	—	—	50-0
R5	6	30	4-6	1	—	—	135-0
R6	6	14	4-6	1	—	—	63-0
R7	6	36	12-8	21	4-4	8-4	456-0
R8	6	26	4-4	1	—	—	112-8
R9	6	14	4-4	1	—	—	60-8
R10	6	4	12-2	21	4-1	8-1	48-8
R11	7	14	13-0	1	—	—	182-0
R12	6	10	5-0	1	—	—	50-0
R13	6	30	4 6	1	—	—	135-0
R14	6	10	4 6	1	—	—	45-0
R15	6	30	4-0	1	—	—	120-0
R16	6	10	4-0	1	—	—	40-0
R17	6	36	12-2	21	4-1	8-1	438-0
R18	6	4	11-8	21	3-10	7-10	46-8
R19	5	26	6-7	1	—	—	171-2
R20	5	8	6-7	1	—	—	52-8
R21	7	14	13-0	1	—	—	182-0
R22	5	10	5-0	1	—	—	50-0
R23	5	30	4-6	1	—	—	135-0
R24	5	10	4-6	1	—	—	45-0
R25	7	24	11-8	21	3-10	7-10	280-0
R26	5	30	3-8	1	—	—	110-0
R27	5	10	3-8	1	—	—	36-8
R28	7	4	11-4	21	3-8	1-0	45-4

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
T1	5	16	8-2	1	—	—	132-8
T2	5	8	12-4	1	—	—	99-8
T3	5	10	12-4	1	—	—	123-4
T4	6	14	13-0	1	—	—	182-0
T5	5	12	5-0	1	—	—	60-0
T6	5	16	8-4	1	—	—	133-4
T7	5	10	12-4	1	—	—	123-4
T8	6	28	11-4	21	3-8	7-8	317-4
T9	5	4	13-0	1	—	—	52-0
T10	5	2	5-0	1	—	—	10-0
T11	5	8	11-4	21	3-8	7-8	90-8
T12	5	4	5-0	21	1-0	4-0	20-0
T13	5	10	13-4	1	—	—	133-4
T14	5	16	4-2	1	—	—	66-8
T15	5	10	13-4	1	—	—	133-4
T16	5	16	4-2	1	—	—	66-8
T17	5	8	13-4	1	—	—	106-8
T18	5	18	4-2	1	—	—	75-0

BAR TYPES

STR.

TYPE 1

B C

TYPE 21

AS BUILT

Notes:
1. Bar dimensions are out to out of bar.
2. The 2" and 3" dimensions from face of concrete to steel are clear distances.
3. Radius of bends equals 3 bar diameters for sizes equal to or less than #7.

-A

A

12-0'

15-0'

ELEVATION

QUANTITIES

STEEL	#5 BARS	2024-2	2111-2	lbs. 2111-2
	#6 BARS	4454-6	6690-7	lbs. 6690-7
	#7 BARS	1053-4	2153-0	lbs. 2156-2
	#8 BARS	744-4	1987-4	lbs. 19874
			12,942-2	lbs. 12,945 5#

CONCRETE = 673 CU. YDS.

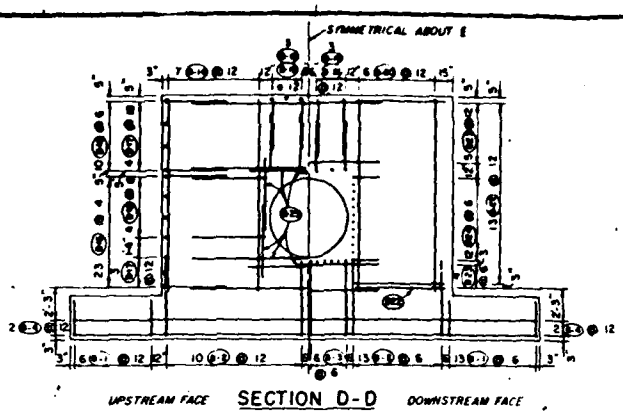
RISER STRUCTURAL DETAILS
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

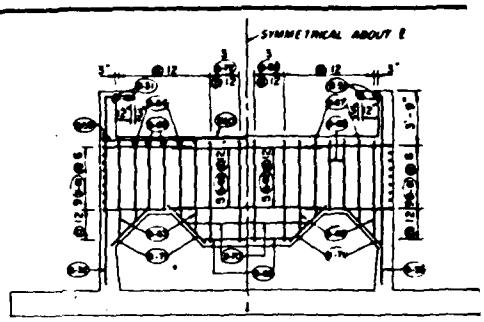
Designed MANK & M. BOYSEN	Date 6-68	Approved by
Drawn R. BONTZ	9-68	Title
Traced R. BONTZ	9-68	Title
Checked		Sheet No. 12 of 25

Drawing No. MD 407-P

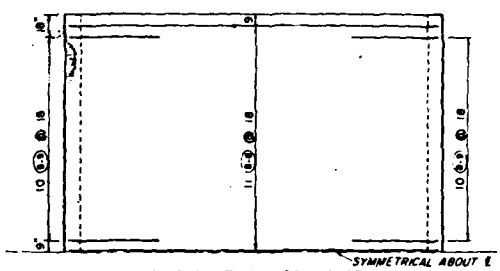
PLATE NO. 6



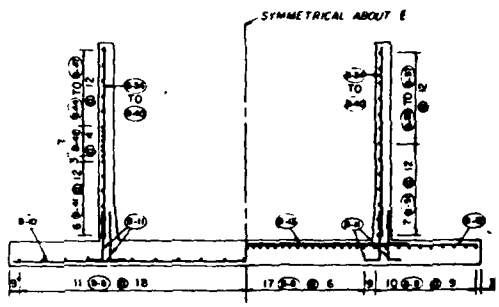
UPSTREAM FACE **SECTION D-D** DOWNSTREAM FACE



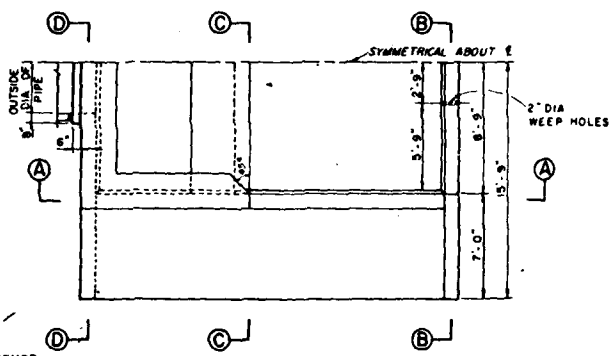
DOWNSTREAM FACE **SECTION THRU BAFFLE** UPSTREAM FACE



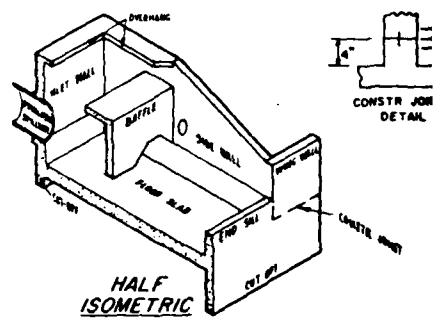
PLAN OF FLOOR SLAB BOTTOM FACE



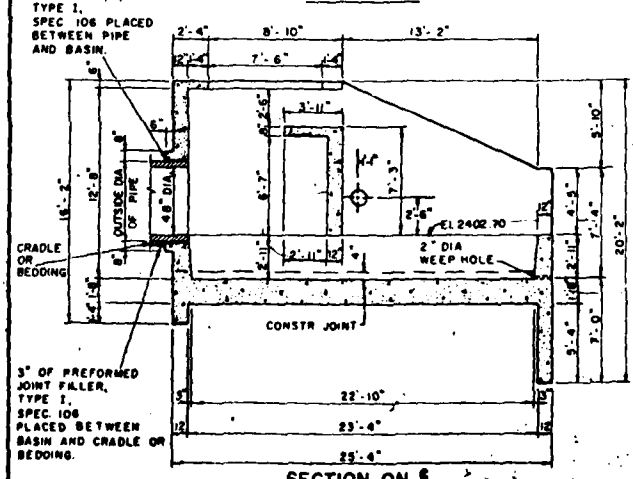
OUTSIDE FACE **SECTION C-C** INSIDE FACE



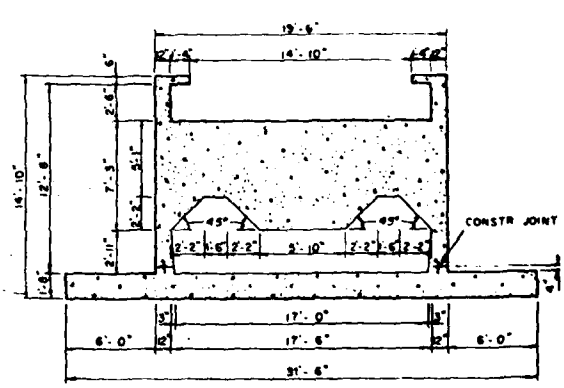
PLAN VIEW



HALF ISOMETRIC

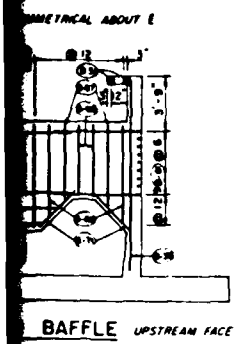


SECTION ON ℄

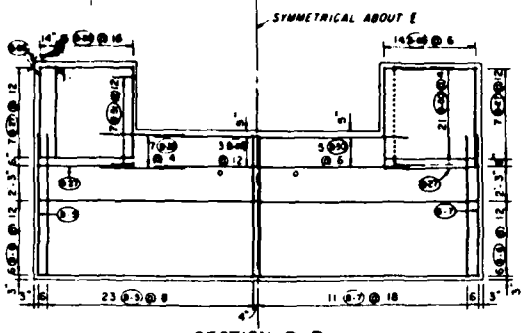


SECTION THRU BAFFLE

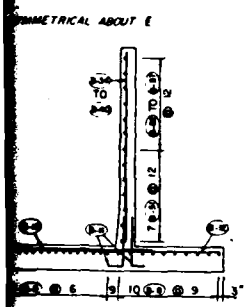
MAX ALLOWABLE DISCHARGE = 400 CFS	INSIDE DIA OF PIPE 72" MAX 48" MIN



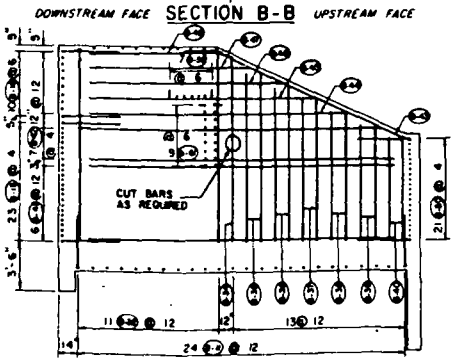
BAFFLE UPSTREAM FACE



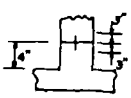
DOWNSTREAM FACE SECTION B-B UPSTREAM FACE

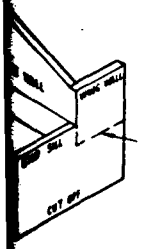


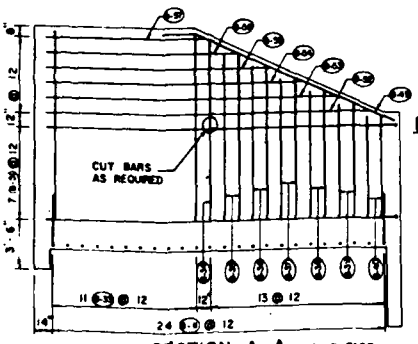
C-C INSIDE FACE



SECTION A-A OUTSIDE FACE

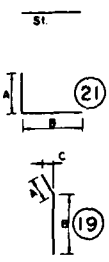


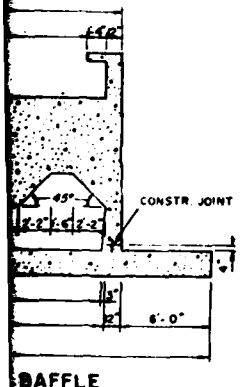




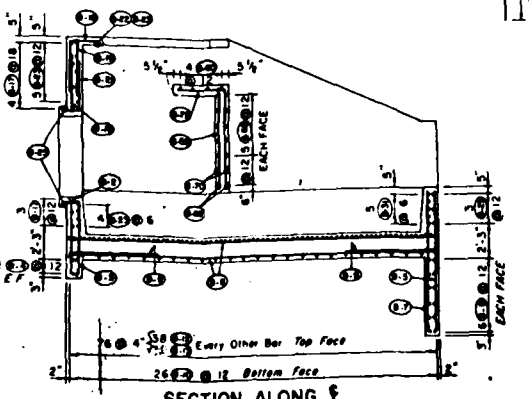
SECTION A-A INSIDE FACE

BAR TYPES





BAFFLE



SECTION ALONG ℄

SCALE

INSIDE DIA OF PIPE 72" MAX. 48" MIN

STEEL SCHEDULE

MARK	LOCATION	QUAN	SIZE	LENGTH	TYPE	A	B	C	TOTAL FT
B-1	CUT-OFF UPSTR	38	5	2-6	St				95 00
2		46	5	5-0	St				230 00
3		11	5	6-0	21	5-0	1-0		66 00
4		4	5	31-0	St				124 00
B-5	CUT OFF DWNSTR	48	5	9-6	St				456 00
6		12	5	31-0	St				372 00
7		23	6	9-6	St				218 50
8	FLOOR SLAB	74	6	25-0	St				1850 00
9		40	6	6-0	St				240 00
B-10		26	5	31-0	St				806 00
11		96	5	4-3	21	3-3	1-0		408 00
12		38	8	31-0	St				1178 00
13		38	8	22-0	St				836 00
14	INLET WALL	14	5	14-6	21	12-7	1-11		203.00
B-15		6	5	5-0	21	3-3	1-9		30 00
16		66	7	8-0	21	4-0	4-0		528 00
17		7	7	15-6	St				108 50
18		8	7	5-0	St				40 00
19		12	7	3-9	St				45 00
B-20		12	5	12-7	St				151 00
21		6	5	4-3	21	3-3	1-0		25 50
22		30	5	6-0	St				180 00
23		10	8	9-6	St				95 00
24		24	8	2-7	21	1-7	1-0		62 00
B-25		8	5	4-9	St				38 00
26	WING WALL	40	6	6-6	St				260 00
27		32	5	6-C	St				208 00
28	END SILL	14	7	6-0	St				84 00
29		3	7	15-0	St				45 00
B-30		5	6	21-3	St				106 25
31		4	6	9-6	St				38 00
32	SIDE WALLS	22	5	14-5	21	12-7	1-10		317 17
33		22	5	12-7	St				276 83
34		4	5	12-0	St				48 00
B-35		8	5	11-3	St				90 00
36		8	5	10-3	St				82 00
37		8	5	9-6	St				76 00
38		8	5	8-6	St				68 00
39		8	5	7-9	St				62 00
B-40		8	5	6-9	St				54 00
41		12	8	21-6	St				258 00
42		14	7	21-6	St				301 00
43		2	8	17-6	19	2-6	15-0	1-2	35 00
44		2	8	18-9	St				37 50
B-45		2	8	16-6	St				~~36 60~~ 33.00
46		2	8	14-3	St				28 50
47		2	4	12-0	St				24 00
48		2	8	9-6	St				19 00
49		2	6	17-0	19	2-0	15-0	10½	34 00
B-50		42	7	4-11	21	3-4	1-7		206 50
51		14	6	25-11	21	24-4	1-7		362 83
52		2	6	22-9	St				45 50
53		2	6	20-6	St				41 00
54		2	6	18-3	St				36 50
B-55		2	6	16-0	St				32 00
56		2	6	13-9	St				27 50
57		2	6	11-6	St				23 00
58	BAFFLE	6	5	6-9	St				40 50
59		14	5	6-8	21	6-2	0-6		92 17
B-60		4	5	10-0	St				40 00
61		36	4	6-4	21	5-10	0-6		228 00
62		10	4	10-0	St				100 00
63		4	5	9-9	21	6-3	3-6		39 00
64		4	5	8-9	21	5-3	3-6		35 00
B-65		4	5	8-0	21	4-6	3-6		32 00
66		4	5	6-3	St				25 00
67		4	5	5-3	St				21 00
68		4	5	4-6	St				18 00
69		2	5	6-3	St				12 50
B-70		2	5	8-3	St				16 50
71		8	5	3-6	St				28 00
72		6	5	10-3	21	6-9	3-6		61 50

QUANTITIES

REINFORCING STEEL BARS

NO. 4 BARS	328.0 LIN FT	219.1 LBS	219.1 lbs
NO. 5 BARS	4927.7 LIN FT	5139.6 LBS	5139.6 lbs
NO. 6 BARS	3319.1 LIN FT	4979.3 LBS	4979.3 lbs
NO. 7 BARS	1358.0 LIN FT ~~2776.6~~	LBS	~~2779.8 lbs~~
NO. 8 BARS	2605.5 LIN FT ~~6756.7~~ 99.6	LBS	~~4958.0 lbs~~

CONCRETE CLASS 4000 ~~504~~ CU. YDS

LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6
IMPACT BASIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

AS BUILT

W.H. Leaming 8/63
M NIKOLICH
T O PURKEY
F M WYSONG,

Sheet No. 10 of 25 Drawing No. MD 407-P

PLATE NO. 7

AH 1A STA 5+60 rt. 70' Emergency Spillway Elev. 2444.6

From	To	Description
0.0	0.5	Topsoil
0.5	20.0	Sandy silt, cobbles & brown sand

AH 1B STA 2+95 lt. 40' Emergency Spillway Elev. 2447.6

From	To	Description
0.0	0.5	Topsoil
0.5	20.0	Brown or yellow sand - clay & cobbles

AH 204 STA 4+10 lt. 90' Emergency Spillway Elev. 2452.0

From	To	Description
0.0	0.5	Topsoil
0.5	20.0	Brown or yellow sand & silt w/some cobbles & clay

AH 204A STA 3+10 lt. 105' Emergency Spillway Elev. 2450.2

From	To	Description
0.0	0.5	Topsoil
0.5	2.0	Brown sand w/some silt & SS frag.
2.0	14.0	Brown sand w/some silt, rock frag. & cobbles
14.0	15.0	Brown sand w/some clay & rock frag.
15.0	18.0	Brown sand w/little silt
18.0	20.0	Soft gray shale

AH 205 STA 6+45 lt. 125' Emergency Spillway Elev. 2451.6

From	To	Description
0.0	0.5	Topsoil
0.5	20.0	Brown sand

AH 604A STA 3+10 rt. 80' Emergency Spillway Elev. 2442.5

From	To	Description
0.0	0.5	Topsoil
0.5	20.0	Brown sand cobbles w/some clay

DM 10 Elev. 2434.4 C/L Dam Sta. 14+89 Rng. 0+15 rt.

From	To	Description	Sample	N	USCS	Type Bit Used	Rec. %
0.0	0.5	Topsoil					
0.5	4.0	Clayey Sand. w/some fine gravel & occ. cobble. Med. dense to dense, med. plas. fines, sl. moist, yel. brn. Sand generally fine. Residuum.	0.5-1.5	6	SC	spt	
			2.0-3.0	31			
			3.0-4.0	100			
		Drove casing to 4.0'					
4.0	9.0	Shale-highly weathered. Recovered as: Silty clay, med. stiff to stiff, med. plas., moist, brn. & gray, iron stained thin bedded, highly fractured.	6.0-7.5	21		spt	
			8.0-9.0	47	CL		
		Drove casing to 9.0'					
9.0	15.0		9.5-10.5	49	CL	spt	
			11.0-12.0	46			
			12.5-13.5	41			
			14.0-15.0	96			
			refusal 15.0				
15.0	19.0	Shale-highly weathered w/thick clay seams of weath. parent shale. Very soft to soft, moist, yel. brn. & gray, thin bedded, dip 5-10°, very highly fractured horizontal & vertical.				Rcd.	55%
		▼ W.L. 10-13-67 @ 18.0' depth (incl. Artesian pressure)					
19.0	21.0					Rcd.	75%
21.0	26.0	Lost half drilling fluid @ 24', approx. 12 gpm				Rcd.	90%
		▼ W.L. 10-4-67 @ 26.0' depth					
26.0	30.0	Decrease am't. of clayey layers. Now gray in color.					97%
30.0	33.0	Shale-moderately weathered, soft, moist, dk. gray, thin bedded, dip 5-10°, highly jointed & fractured, horizontal & vertical, occ. thin clay seam					100%
33.0	36.0	Mod. Hd. & silty 33.0 to 34.5; very soft & clayey 34.5 to 38.5					100%
36.0	40.0	Becoming yellow w/iron stain from 38.5, slightly hard, contains some silt. No appreciable loss of drilling fluid.					83%
40.0	46.0	40.0-40.5 red w/Fe stains 40.5-41.0 reduced to soft yellow clay 41.3-43.0 siltstone (w/v.f.sand), argillaceous mod. hd. to hd., thin to med. bedded, dip 5-10° 43.0-46.0 Shale-weathered (MH like) very soft, moist, yellow gray.					92%
46.0	51.0	Conglomeratic Sandstone, massive, coarse grained well cemented, white w/iron stains, composed of quartz sand & lenticular quartz pebbles. Jointed vertical & horizontal. Joints open, Fe stained & w/thin clay coatings.					98%
51.0	56.0	Conglomeratic Sandstone, massive, coarse grained, well cemented, white w/iron stains composed of quartz sand & lenticular quartz pebbles. Jointed vertical & horizontal. Joints open, Fe stained & w/thin clay coatings.				Rcd.	98%
56.0	59.5	Now w/some finer grained sandstone.					100%
59.5	63.5	Now med. grained sandstone w/gray tint.					100%
63.5	66.0	Sandstone, massive, fine to med. grained, red changing to gray, hard, well cemented, moderately jointed.					94%
66.0	71.0	Sandstone, massive, fine grained, hard, well cemented, moist, slightly argillaceous.					100%
71.0	76.0						
76.0	81.0	Left 1.7' in bottom of hole.					100%
81.0		Bottom of hole.					100%

Water pressure tests.

4.0-9.0 7'H K-0.3	29.0-34.0 33.1'H K-1.96
9.0-15.0 12'H K-0.03	15.0-81.0 25.4'H K-1.7
15.0-19.0 similar to above	0.0-6.0 3'H K-0.46
19.0-21.0 some leakage	
19.0-26.0 18.5'H K-11.35	
66.5081.0 52.3'H K-0.15	
45.0-81.0 52.3'H K-0.28	
40.0-45.0 52.3'H K-0.00	
35.0-40.0 Packers would not hold when drilled	
No increase in water loss from depth 19' to 26'	
30.0-35.0 Same as above	

DM 11 Elev. 2450.0 C/L Dam Sta. 16+98 Rng. 0+10 lft.

From	To	Description	Sample	N	USCS	Type Bit Used	Rec. %
0.0	1.0	Topsoil some cobbles & small boulders in vicinity of setup.				spt	
1.0	9.0	Clayey Sand. Med. dense, med. plas. fines, moist, yellow brn., sand coarse-angular of quartz. (weathered rubble zone)	2.0-3.0	18	SC		
			3.5-4.5	23		spt	
			5.0-6.0	35			
			6.5-7.5	37			
			8.0-9.0	31			
		Casing driven to 9.0'					
9.0	15.0	Clayey Sand, now very dense.	9.5-10.5	50			
			11.0-12.0	26	SC	spt	
			12.5-13.5	82			
			14.0-15.0	26			
		Casing driven to 15.0'					
15.0	19.5	Clayey Sand, med. dense	15.5-16.5	22			
			17.0-18.0	28	SC	spt	
			18.5-19.5	23			
		Casing driven to 19.5'					
19.5	24.0	Same as above to 20.0; from 20.0' Sandy Clay (residuum of shale) very stiff to hard, med. plas., moist, yel. brn., sand coarse.	20.0-21.0	26	SC	spt	
			21.5-22.5	38	CL		
			23.0-24.0	57			
		Casing driven to 24.0'					
		▼ W.L. 20.5' 10-9-67 (incl. Artesian Press.)					
24.0	28.5	Lean Clay w/weathered shale frags. Hard, med. plas., moist, yel. brn., highly fract. saprolite.	24.5-25.5	92	CL	spt	
			26.0-27.0	77			
			27.5-28.5	64			
		Reamed hole w/3 5/8" tricone					
28.5	31.5	Same as 24.0 to 28.5	29.0-30.0	33		spt	
			30.0-31.0	52			
			refusal 31.5				
31.5	37.0	31.5-33.7 Siltstone-highly weathered, soft to mod. hd., moist, med. thickness, iron stained, highly fractured, clay seams. 33.7-36.7 Very soft shale (MH or CH), highly plastic, micaceous, gray, can be indented w/finger; @ 36.7 Conglomeratic Sandstone.				Rcd.	80%
37.0	41.5	Conglomeratic Sandstone, weathered, massive, well cemented, coarse quartz & lenticular quartz, pebbles rounded. Highly jointed & fractured vertical & horizontal, open, ironstained & clay filled, dip 5°					24%
41.5	47.0						100%
47.0	52.0						84%
52.0	57.0	Sandstone thick to thin bedded, fine to med. grain, well cemented, lt. olv. gray, mod. hd. to hd., highly jointed vertical & horizontal w/clay seams, dip 5°					.46%
57.0	61.0	Sound rock @ 60.8' depth					100%
61.0	67.0	Sandstone, fine grain, massive, well cemented, dk. gray, solid relatively intact w/occ. joint, dip 5°					100%
67.0	72.0	@ 71.5 very soft dk. gray shale					100%
72.0	75.0	Shale w/occ. thin sandstone; shale soft to very soft, dk. gray, moist, thin bedded; sandstone mod. hd. to hd., fine grain, dk. gray, all highly jointed, dip 5°					100%
75.0		Bottom of hole No appreciable amounts drilling fluid lost.					

Water pressure tests

9.0-10.5 No water loss	62.0-75.0 66.2'H K-0
9.0-15.0 12'H K-0.21	57.0-62.0 66.2'H K-0.38
15.0-19.5 No water loss	52.0-75.0 66.2'H K-0.0002
19.5-24.0 20'H K-0.009	47.0-52.0 ----
24.0-28.5 No water loss	42.0-47.0 66.2'H K-0.38
28.5-31.5 20'H K-0.05	24.0-75.0 66.2'H K- 0.06
24.0-75.0 20'H K-0.09	

DM 14 Elev. 2438.1 C/L Dam Sta. 6+45 Rng. 0+05 rt.

From	To	Description	Sample	N	USCS	Type Bit Used	Rec. %
0.0	1.0	Topsoil					
1.0	3.5	Sandy Clay w/some gravel & ang. flags., hard, med. plas., sl. moist, yellow, gravel of shale & siltstone.	2.0-3.0	41	CL	spt	
			refusal 3.5				
		Drove casing to 3.5'					
3.5	4.5	Interbedded siltstone & shale-highly weath. Siltstone mod. hd., moist, thin bedded, iron stained, yellow. Shale soft, moist, yellow, iron stained, thin bedded, clay seams.				Rcd.	75%
4.5	6.0						73%
6.0	7.5	More yellow clay.					47%
7.5	11.0	Conglomeratic Sandstone, massive, coarse grained, well cemented, quartz-sand & lenticular quartz pebbles, white stained w/iron. Open & iron stained, clay coated, joints vertical & horizon.					100%
11.0	16.0						100%
		Drove casing to 7.0'					
16.0	21.0	w/yellow clay seam					100%
		▼ W.L. 17.7' 10-20-67					
21.0	26.0	Slickensides noted					98%
26.0	31.0	Same as above to 29.0' (lost water @ 26.5). @ 29.0 Sandstone fine grain, massive, well cemented, hard, dk. gray, slickensides noted, relatively intact.					100%
31.0	36.0	Same as from 29.0 - no slickensides.					100%
36.0	41.0	Slick @ 36.4'					100%
41.0	46.0	Same as above to 45.6 - slicks in Sandstone @ 45.6 Shale soft, dk. gray					97%
46.0	51.0	Shale w/thin interbedded silty sandstones. Shale-soft, moist, dk. gray, thin bedded. Sandstone-fine, mod. hd. to hd., dk. gray, thin bedded. All highly fractured, with mud or gouge seams of parent shale. Low angle dip. Highly slickensided.					68%
51.0	56.0	Same as above to 51.7 (Major movement zone) From 51.7 marked decrease slicks & gouge. Lithology the same as above now rel. intact Shale interbedded w/thin silty sandstones.					86%
56.0	60.0	[illegible]					98%

Bit Rec.									
Bed 1	DH 14 (continued)								
	60.0	66.0	Shale-sound, soft to med. hd., moist, dk. grey, thin bedded, dip 5-7° intact w/only minor accommodation slicking.						
	66.0	71.0							100%
	71.0		Bottom of hole						
			Water pressure tests						
			0.0-3.5 2'W K-0			44.0-49.0	10.7'N	K---	
			3.5-7.0 3'W K-0			47.0-71.0	36.1'N	K-2.8	
			7.0-16.0 -- K-minute			42.0-47.0	13.0' N	K---	
			0.0-24.0 No drilling fluid lost until approx. 25' depth			37.0-42.0	13.0'N	K---	
						35.0-40.0	13.0'N	K---	
			7.0-26.0 17.6' N K-4.5			32.0-37.0	17.6' N	K---	
			7.0-26.0 17.6'N K=10.3			27.0-32.0	52.2'N	K-7.2	
			67.0-71.0 63.8'N K-0.8			22.0-27.0	52.2'N	K-6.7	
			62.0-67.0 63.8'N K-0.35			17.0-22.0	33.8'N	K-12.6	
			62.0-71.0 63.8'N K-1.2			12.0-17.0	23.7'N	K-18.2	
			57.0-62.0 63.8'N K-0.0018			7.0-71.0	19.9'N	K-2.8	
			57.0-71.0 63.8'N K-0.7						
			49.0-71.0 63.8'N K-0.7						
	DH 15 Elev. 2430.0 C/L Dam Sta. 7+93 Rng. 0+00								
	0.0	1.0	Topsoil many 8" to 10" cobbles in setup area.						
	1.0	3.0	Silty Sand w/gravel; med. dense to dense, low plas. fines, moist, yel. brn., sand f-m, gravel ang., residuum-talus	2.0-3.0	38	SM	spt		
	3.0	4.5	Boulder exceeds 50% by volume; remainder: Silty Sand w/some gravel, dense, low-non plas., moist, yel. brn., angular fine to coarse.	3.5-4.5	67	SM	spt		
Bed. 80%			Drove casing to 4.5'					tricone	
	4.5	7.5	Sandstone Boulders w/mud seams, med.-coarse grain, mod. Hd., mod. well cemented, grey & redish brn., lost drilling fluid @ 7.0'					Rcd.	52%
24%	7.5	9.5	Silty Sand w/some clay & ang. gravel, med. dense, low plas. fines, moist, yel. brn. sand med.-coarse	8.0-9.0	33	SM	spt		
			Advanced casing to 9.5'						
100% 84%	9.5	11.0	Boulder. Sandstone, grey-med. grain, some clay coating.					Rcd.	80%
46%	11.0	14.8	Silty Sand w/some ang. gravel & flags., med. dense to dense, low-non plas. fines, wet to moist, brown & grnsh. brn., fine to med. grain.	11.5-12.5	68	SM	spt		
100% 100%			Advanced casing to 14.5'	14.5-14.8	58				
		▼	W.L. @ 14.5' depth 10-13-67						
100% 100%	14.8	18.5	Sandstone (Boulders?), much of recovery mud seams, sandstone is fine grain, mod. hd., olv. grey, iron stained.					Rcd.	70%
	18.5	19.2	Same as above to 18.9; at 18.9 probable real bedrock contact.						86%
	19.2	22.5	From 18.9 Sandstone med. thick bedded, fine grain, med. grey, mod. hard to hard, well cemented, moderately jointed w/Fe stains occ. olv. gry.						94%
38 .0802	22.5	23.0	occ. mud seam						100%
38 1.06	23.0	26.5	Jointed vertical & horizontal, open & clay filled & iron stained.						91%
	26.5	30.5	Same as above to 30.0'; at 30.0' soft gray shale.						58%
	30.5	34.0	Shale w/thin interbedded f. silty sandstones; shale soft, grey, moist, thin bedded, highly broken, fractured & jointed, mud seams of parent shale. Hole caving @ 30.0', sandstones f. grain, highly broken, mod. hd. to hd.						51%
spt	34.0	36.0							87%
	36.0	39.0	Shale as above-dip @ 36°-40°-now with white mineral coating on slickensides & some joint plains caving @ 31'						100%
Bed. 75%			Rubble zone 37.7' to 39.0'						
	39.0	41.0	dip @ 39°-60-70° caving @ 32'						100%
	41.0	46.0	Now with rubble and mud seams, (dip @ 40°-45°; @ 41°-30°) of parent shale.						54%
73% 47% 100%	46.0	51.0	Rubble of slickensided & ground up shale. Mud seams of parent shale.						84%
	51.0	53.0							51%
	53.0	56.0	dip @ 45°						93%
100%	56.0	59.0	Slight decrease in intensity of fault zone, otherwise same as above. Dip 45°, cave in @ 56'						107% 83%
100%	59.0	63.0	Interbedded shale & fine sandstone; shale soft, grey; sandstone fine, gray, med. hd. to hd. All mod. slicked, w/wht. mineral, qtz. mineral mod. broken, steep joints & slicks.						
98% 100%									
	63.0	64.0	Some Pyrite encountered.						100%
100% 100% 92%	64.0	67.0	Shale soft to mod. hd., dk. gray, mod. slicked & broken w/many of the fractures healed w/quartz or soft white mineral. Steep dip-55°						98%
68%	67.0	72.0	Same as above to 67.7; @ 67.7; Shale now relatively intact w/only occ. slick. Soft to mod. hd., dk. gray, some steep fractures.						100%
	72.0	77.0	Some interbedded f. dk. gray sandstone mod. hd. to hd.						
86%	77.0		Bottom of hole						
			Water pressure tests						
			0.0-11.0 5.5'W K-52.3			25.9-77.0	-1.7'N	K---	
			4.5-6.5 5.5'W K-175.1			20.7-25.7	---	---	
98%			9.3-11.0 10.0'W K-116.9			17.0-77.0	---	---	
			Remarks: 15.1 pcf @ 9'-21.0'						

LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel; sand; silt; clay; cobbles, boulders; gravel, sandy; sand, gravelly; silt, gravelly; clay, gravelly; peat or muck; gravel, silty; sand, silty; silt, sandy; clay, sandy; gravel, clayey; sand, clayey; silt, clayey; clay, silty

CONSOLIDATED MATERIAL

Sedimentary Rocks

Conglomerate Cng; shale sh.; limestone ls.; coal; breccia brc; siltstone slst.; dolomite dol; gypsum gyp.; sandstone ss.; marl; chalk clk.; chert cht.

Metamorphic Rocks

gneiss; schist; quartzite; slate; marble; soapstone talc serpentine

Igneous Rocks

intrusive; extrusive; pyroclastic

Undifferentiated

Other Symbols

hole logged only; hole sampled; strike and dip; pit or trench

ABBREVIATIONS

ang.	angular	lam.	laminated
bld.	boulders (> 12")	lse.	loose
calc.	calcareous	mas.	massive
calc.	caliche	med.	medium
cav.	cavities	mic.	micaceous
crmt.	cemented	mod	moderately
csa.	coarse	n. r	no recovery
cbl.	cobbles (3"-12")	per.	permeable
cpt	Compact	po.	poorly
con.	concretions	rdd	rounded
xln.	crystalline	sl/	slightly
dk.	dense	sft.	soft
dip.	dipping	s/.	some
d.s.	downstream	slo.	slowly
fn.	fine	stf	stiff
frm.	firm	t.b.	thin bedded
frac.	fractured	tuff	tuffaceous
frg.	fragments	u.s.	upstream
fri.	friable	var	variable
grn	grain	v/	very
gyp	gypseous	w/	with
hd.	hard	wea	weathered
h	highly	w/l	(date) static water level

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1	99	Stream channel	401	499
Borrow area	101	199	Relief wells	501	599
Emergency spillway	201	299		601	699
Centerline of outlet structure	301	399		701	799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels, gravel sand mixtures
GP	Poorly graded gravels
GM	Silty gravels, gravel sand-silt mixtures
GC	Clayey gravels, gravel sand-clay mixtures
SW	Well graded sands, sand gravel mixtures
SP	Poorly graded sands
SM	Silty sand
SC	Clayey sands, sand-clay mixture
ML	Silts with liquid limit of 50 or less
MH	Silts with liquid limit above 50
CL	Clays with liquid limit of 50 or less
CH	Clays with liquid limit above 50
OL	Organic silts and clays with liquid limit of 50 or less
OH	Organic silts and clays with liquid limit above 50

Revised February 1963

AS BUILT

LOGS OF TEST HOLES
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	B. Jamison	Date	Approved by
Drawn	C. Porter		Title
Traced			Title
Checked		Sheet No. 20	Drawing No. MD 407-8

PLATE NO. 8

DH 16 Elev. 2411.0 C/L Dam Sta. 9+07 Rng. 0+00

			U S C		Type Bit Used	Rec. %
0.0	1.0	Topsoil. Boulders in setup area. Generally 12"x12"x24". Have noticed boulders in vicinity that will exceed 1 cu. yd., generally of conglomeratic sandstone.			spt	
	▼	W.L. 0.8' depth 11-2-67				
1.0	3.5	Drove casing to 3.5'. Boulders exceeding 75% volume; remainder CL Sandy Clay.				
	▼	W.L. 1'. Artesian Head Feb. 68				
3.5	5.0	Recover-Sandy Clay w/some angular gravel. Boulders exceeds 50% by volume. Sandy clay is hard, moist, med. plas., brn. Refusal 5.0'	4.0-5.0	63 CL	spt	
5.0	9.0	Drove casing to 9.0 Boulders and clay seams as above.				
9.0	9.5		Refusal 9.5'		spt	
9.5	10.5	Tricone				
10.5	12.0	Mud seam or gouge w/sandstone frags. very soft, moist, dk., gray, iron stains, rubbly - recovered as CL-CH	11.0-12.0	25	spt	
		Drove casing to 12.0', hit hard rock				
12.0	16.0	Mud seams & sandstone. Sandstone fine, dk. gray, hard, well cemen. very highly fract. Rubbly, slickensided-soft white mineral coatings.			Rcd.	30%
16.0	21.0	Shale-soft to very soft, moist, dk. gray, slicked, highly fractured w/soft white mineral coatings. Mud or gouge seams of parent shale. Rubble zone. Dip 7° to 20° then 20°.				86%
21.0	26.0					76%
26.0	31.0	Hole caving @ 26'-now w/thin interbedded silty sandstones, mod. hd., dip 40°, rock torn, stressed. Drove casing to 26.0' depth.				62%
31.0	36.0	Dip occ. increases to vertical				90%
36.0	41.0	From 36.5'-shale w/interbedded sandstones. Shale soft to mod. hd., moist, dk. gray, thin bedded. All relatively sound w/only minor accommodation slicking, dip 7°.				100%
41.0	46.0	Same as above.				94%
46.0		Bottom of hole.				

Water pressure tests

0.0-5.0 2.0'H K-0.56	30.5-36.0 50.6'H K-2.4
12.0-16.0 36.8'H K-12.2	30.5-41.0 46.2'H K-1.6
16.0-21.0 13.8'H K-34.0	42.5-46.0 46.2'H K-1.6
16.0-26.0 13.8'H K-20.7	37.5-42.5 46.2'H K-0
26.0-31.0 50.6'H K-2.7	30.5-46.0 48.1'H K-1.7
26.0-31.0 110.4'H K-3.9	

DH 18 Elev. 2404.6 C/L Dam Sta. 11+54 Rng. 0+00

0.0	1.0	Topsoil				
	▼	W.L. before first run w/core bbl. was 1' below ground surface.				
1.0	4.5	Silty Clay-soft, med. plas., wet, yel. brn., very slightly organic	2.0-3.0	3 CL	spt	
4.5	6.0	Clay-moderately organic w/some frags. of vegetation including decayed tree trunks & branches.	5.0-6.0	7 CL	spt	
6.0	10.5	Shale-highly weathered, v. soft, dk. olv gray, moist, thin bedded, very highly fract.	6.5-7.5 9.0-10.0 Refusal 10.5	15 68	spt	
		Drove casing to 10'				
10.5	13.5	Shale-slightly weathered, soft, moist, dk. gray, thin bedded w/occ. thin f. Argillaceous Sandstone, mod. hd., dip 7°-highly fract. & jointed.			Rcd.	93%
13.5	18.5					
18.5	23.5					100%
23.5	28.5	Shale w/thin interbedded f. sandstones; shale dk. gray, moist, thin bedded, soft; sandstone dk. gray, moist, mod. hd. to hd. Mod. jointed.			Rcd.	
28.5	33.5	Has some rubble shale or gouge in occ. zones from 31' depth w/white mineral coatings on jts. & fract. surfaces. Some steep jts. or gouge zones.				98%
33.5	38.5	Increase % f. sandstone				94%
38.5	43.5	Interbedded v.f. arg. sandstones & shales. To 41.0' predom. sandstone. Sandstone mod.hd. to hd., moist, fine grain, well cemented-muddy dk. gray. Shale soft, moist, dk. grey. All mod. fractured. From 41.0' Shale-very soft, MH like material-unctuous very soft. Highly fractured.				86%
43.5	48.0	MH like material continues to 46.5, deforms under finger pressure. From 46.5-Siltstone containing some v.f. sand., mod. hd., dk. gray, sl. moist, med. bedded., dip 7°.				91%
48.0	51.5	Siltstone as above to probably 49.1' depth From 49.1' to 51.3' lost core. This is in zone that shows a high plasticity silt-clay material in other drill holes. From 51.3' conglom. sand.				37%
51.5	56.5	Conglomeratic Sandstone-coarse grain, massive Fe stained white to very lt. gray. Composed of quartz sand & lenticular quartz pebbles. Jointed near horizontal @ bedding and w/vertical open & iron stained joints.				100%
56.5		Bottom of hole.				
	▼	W.L. Artesian pressure at estimated 5' above ground level. Flow @ 3-5 gpm. (Artesian conditions were still in effect Jan. 68)				

Water pressure tests

52.0-56.5 52.7'H K-1.5	22.0-27.0 38.9'H K-10.4
47.0-52.0 38.9'H K-3.5	27.0-36.5 18.1'H K-5.6
47.0 56.5 38.9'H K-2.7	24.0-36.5 18.1'H K-11.3
41.0-56.5 1.9'H K-54.1	19.0-24.0 27.2'H K-14.6
36.0-41.0 --- ---	14.0-19.0 41.2'H K-3.5
32.0-37.0 52.7'H K-1.4	
25.5-30.5 52.7'H K-2.3	

DH 19 Elev. 2418.2 C/L Dam Sta. 12+30 Rng. 0+04 Lft.

0.0	1.0	Top soil				
1.0	4.5	Sa[illegible]rolite of siltstone & v.f. sandstone Recovered as: Clayey Gravel w/angular & thin flagge. Dense med. plas. fines, sl. moist, yel. brn. & gray, iron stained.	2.0-3.0 3.5-4.5			
4.5	9.0	Shale-highly weathered. Recovered as: Clayey Gravel-Gravelly Clay, dense, med. plas. fines. moist, yel. brn., iron stained, highly fractured. Casing driven to 9.0'	5.0-6.0 6.5-7.5 8.0-9.0			
9.0	15.0	Shale highly weathered very soft, w/soft white mineral coatings on joint surfaces. Recovered as: Gravelly Clay very stiff to hard, med. plas., moist, olv. brn., highly fract. gravel composed of soft shale frags.	9.5-10.5 11.0-12.0 12.5-13.5 14.0-15.0			
	▼	W.L. 12.8' depth 11-6-67 (includes some Artes[illegible]				
15.0	21.0	Drove casing to 14.9'				15.5-16.5 17.0-18.0 18.5-19.5 20.0-21.0
21.0	22.5	Shale-highly weathered, soft, moist, dk. gray, thin bedded, low angle dip, highly fractured & jointed vertical & horizontal. Soft white mineral coatings on surfaces.				
22.5	26.0	Shale-w/thin interbedded sandstones. Shale soft, moist, dk. gray, thin bedded, sandstone mod. hd. to hd., dk. grey, thin bedded. All w/soft white mineral coatings on surfaces, slickensides and fractured non-weathered, dip 12° mud seams or gouge of parent shale, below 23.9 decrease slicking & soft white mineral.				
26.0	30.8	Same as above w/out slickensides & soft white mineral, mud or gouge of parent shale @ 29.7				
30.8	35.5	Shale w/thin interbedded sandstones, shale soft moist, dk. gray, thin bedded, sandstone mod. hd. to hd., dk. gray, thin bedded. All non-weathered slightly to mod. jtd., relatively intact & sound. * Loss due to rotation				
35.5	39.0	* Core loss due to locked inner bbl.				
39.0	40.4					
40.4	44.5	Dip 10°. From 42.6-interbedded v.f. silty sandstone & shales, soft to mod. hd., sl. moist, dk. gray, thin bedded				
44.5	47.0	Same as above from 42.6 to 46.0 - From 46.0 shale, soft to very soft, dk. gray moist, thin bedded.				
47.0	51.0	Soft to very soft shale continues to 50.9'				
51.0	57.0	From 50.9 Siltstone w/v.f. sand., mod. hd. to hd., sl. moist, mod. gray, thin to mod. bedded dip 5° - @ 55.0 changes to very soft MH type material, easily indented w/finger, plastic moist, gray - @ 56.9 changes to conglom. sand.				
57.0	62.0	Conglomeratic Sandstone, massive, well cemented coarse quartz sand & lenticular pebbles, joints @ bedding, iron stained white.				
62.0		Bottom of hole				

Water pressure tests

9.0-15.0 9'H K-2.3	41.0-46.0 43.7'H K-	
15.0-21.0 9'H K-2.6	52.0-62.0 43.6'H K-	
15.0-30.0 9'H K-7.6	47.0-52.0 43.6'H K-	
37.0-62.0 36.7'H K-3.1	37.0-42.0 36.7'H K-	
32.0-37.0 43.6'H K-1.1	27.0-32.0 346'H K-	
46.0-62.0 36.7'H K-2.4	15.0-62.0 25.2'H K-	

DH 20 Elev. 2424.8 Dam C/L Sta. 13+01 Rng. 0+06 Rt.

0.0	1.0	Topsoil				
1.0	4.0	Sandy siltstone highly weathered. Recovered as: Clayey Gravelshang, flaggs. very dense, med. plas. fines, sl. moist, brn. - Jennings Drove casing to 4.5'	2.0-3.0 3.0-4.0			
4.5	8.0	Shale-highly weathered-silty. Recovered as: Clayey Gravel w/ang. flags., very dense, low plas., moist, olv. grn., iron stained, Jennings	5.0-6.0 6.5-7.5 7.5-8.0			refusal
8.0	12.0	Shale w/thin interbedded siltstones, highly weathered, soft, moist, olv. & brn., clay seams, very highly fract.				
12.0	16.5					
	▼	W.L. 15.5' 10-17-67 (incl. some Artesian P)				
16.5	21.0	Recovery of shale, very soft MH like material highly iron stained, mud seams				
21.0	26.0	Shale-highly weathered, soft, moist, yellow & iron stained, thin bedded, low angle dip, clay seams, highly fractured & jointed @ all angles.				
26.0	31.5					
31.5	37.0	Now gray. No ironstains, soft to very soft.				
37.0	42.0	Shale w/thin interbedded silty sandstone, shale soft, moist, dk. gray, thin bedded sandstone mod. hd. to hd., moist, dk. gray, thin fine grain. All mod. fract. & jointed vertical & horizontal				
42.0	44.5	w/some interbedded mod. hd. siltstone				
44.5	50.5					
50.5	52.0	Same as above to 51.2; very soft shale 51.2 to 51.5 - from 51.5 siltstone				

0-04 Ft.				Type Bit Used	Rec. %
sandstone					
	2.0-3.0	40		apt	
	3.5-4.5	30	GL		
gel.					
	5.0-6.0	53	GC		
	6.5-7.5	37	CL		
ne.	8.0-9.0	44		apt	
stained,					
ft, w/soft					
ed surfaces.					
ery	9.5-10.5	28	CL	apt	
ist,	11.0-12.0	48			
al	12.5-13.5	39			
	14.0-15.0	39			
ncludes some Artesian P)					
	15.5-16.5	29	CL	apt	
	17.0-18.0	55			
	18.5-19.5	76			
	20.0-21.0	109			
moist,				Rcd	40%
gle dip,					
rtical &					
al coatings					
stones.					100%
thin bedded,					
, grey, thin					
al coatings					
fractured non-					
or gouge of					
some slicking					
ne & soft					100%
d parent					
stones, shale					
dded, sandstone					
in bedded.					
med. jtd.,					
					98%
er bbl.				Rcd.	98%
					100%
d v.f. silty					98%
med. hd., sl.					
.0 - From					92%
, dk. gray					
some to 50.9'					60%
nd., med. hd.					97%
thin to med.					
to very					
indented w/finger					
changes to conglom.					
ive, well cemented					92%
er pebbles, jointed					
.0-46.0 43.7'H K-0.11					
.0-62.0 43.6'H K-0.36					
.0-52.0 43.6'H K-0.55					
.0-42.0 36.7'H K-3.7					
.0-32.0 346'H K-5.7					
.0-62.0 25.2'H K-3.3					

0-06 Ft.

ned.	2.0-3.0	77	GC	apt	
ng. flagg.					
sl.	3.0-4.0	88			
	5.0-6.0	63			
ong.	6.5-7.5	78	GC	apt	
	7.5-8.0	85			
, refusal					
stones,				Rcd.	20%
olv. &					
fract.					27%
ne Artesian P)					
ll like					
med seams					54%
moist, yellow					
ow angle dip,					88%
jointed					
					96%
ne very					84%
sandstone,					100%
thin bedded					
, dk.					
fract. &					
lstone					100%
					92%
ft shale					100%
seams					

DH 20 (continued)

							Type Bit Used	Rec. %
52.0	56.5	From 51.5 to 56.9 siltstone w/some v.f. sand. med. hd. to hd., sl. moist, gray, med. bedded, low angle dip well cemented. From 54.9 to 56.5 very soft shale NM like material, highly plastic w/some soft white mineral, moist, gray.						100%
56.5	61.5	Conglomeratic Sandstone, massive, coarse quartz sand & lenticular quartz, pebbles, well cemented iron stained white, jointed @ bedding approx. 10%						98%
61.5		Bottom of hole						
		Water pressure tests						
		0.0-8.0 6'H K=0.84			47.0-52.0 62.5'H K=3.44			
		8.0-12.0 10'H K=2.12			41.C-46.0 62.5'H K=0.17			
		8.0-16.5 12'H K=3.06			46.0-61.5 62.5'H K=0.08			
		57.0-61.5 62.5'H K=0.06			41.0-61.5 62.5'H K=0.11			
		52.0-57.0 62.5'H K=0.55			3[illegible] 0-41.0 62.5'H K=1.8			
		52.0-61.5 62.5'H K=0.02			16.5-61.5 16.5'H K=5.7			

DH 21 Elev. 2435.0 C/L Dam Sta. 7+22 Rng. 0+10 rt.

						Type Bit Used	Rec. %
0.0	1.0	Topsoil - Boulders in setup area - conglomeratic sandstone.					
1.0	2.5	Boulders more than 50% by volume. Remainder: Boulders conglom. sandstone, maxi. d.-3'± Rubble Sandy Clay med. stiff, med. plas., sl. moist, brn.	1.5-2.5 refusal 2.5	71		apt	
2.5	4.5					Rcd.	65%
4.5	6.0	Drove casing to 6.0'					80%
6.0	10.5	Boulders of conglomeratic sandstone more than 50% by volume, well cemented; rubble maxi. d.-3'± Remainder: CL sandy clay: med. stiff to stiff, med. plas., moist, brn.					69%
10.5	16.0						71%
16.0	21.0	Boulders of fine grain sandstone to 17' exceeds 60% by volume, well cemented, hd., gray & grysh. grn. Remainder: CL Sandy Clay - med. stiff to stiff, med. plas., moist, brn. From 17.0' sandstone w/clay seams.					74%
	▼	W.L. 18.4' 10-27-67					
21.0	26.0	Sandstone-fine, well cemented, hard, olv. grn. & dk. gray, massive, dip 10°± -- Highly fract. & jointed, vertical & horizontal, slickensides noted, clay in fractures.					100%
26.0	31.0	Very highly fractured.					100%
31.0	36.0	Same as above to 32.6 - @32.6 to 33.6 shale very soft, NM like mat'l., moist, dk. gray plastic. From 33.6 Sandstone, fine massive, dark gray to grnsh. gray, well cemented, hd., low angle dip, highly fractured w/soft white mineral coating.					100%
36.0	41.0	Same as above to 38.6' From 38.6 Shale, soft & very soft, dk. gray, moist, thin bedded, low angle dip, very highly fractured, jointed & slickensided w/mud seams or gouge of parent shale. Planes coated with soft white mineral.					92%
41.0	46.0	Dip 7° - hole caving					90%
46.0	50.5	Driller remarked that hole is no longer plumb.					33%
50.5	51.0						220%?
51.0	56.0	Hole caving @ 49'					90%
56.0	61.0	Shale w/thin interbedded silty sandstones. Shale soft, moist, dk. gray, thin bedded sandstone med. hd. to hd., dk. gray, thin bedded. Dip now 30° - All slicked w/soft white mineral coatings.					40%
61.0	62.0	Same as above - broke matrix off bit w/diamonds					30%
62.0		Bottom of hole					
		Water pressure tests					
		0.0-6.0 3.0'H K=0					
		16.0-24.0 18.0'H K=>20.4					
		39.0-62.0 18.0'H K=>7.3					
		Head loss exceeded test pressure for all settings. Could not take packer below 39.0' depth.					
		Samples: 21.1 sds 4.0'-13.0'					

KEY TO DRILL HOLE/DH LOGS

00	10	N=16	(N=Number of blows required for 12" standard penetration using 2.0" O.D. split barrel sampler, 140 lb. hammer, and 30" drop. AS"M D 1586)	
10	80	90%	(Per Cent of rock core recovery in soft and rock)	
80	170	CL	(Unified Soil Classification Symbol)	
170	270		(Depth of hole in feet)	
▼		235	2-29-64 (Water Level and Date)	
270			Bottom of hole	

NOTES

All soil and rock descriptions and classifications were determined by visual examination

2 ft. Permeability tests (two per day)

For recovery of Soil Core, Drill Holes, and Auger Holes, see sheets 4.5 & 6

AS BUILT

LOGS OF TEST HOLES
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed [illegible]
Drawn [illegible]
Traced [illegible]
Checked [illegible]
Date [illegible]
Scale [illegible]
Sheet No. 20

PLATE NO. 9

DH 22 Elev. 2405.0 Dam Sta. 11+00 Rng. 0+00

					U S C	S	Type Bit	Rec. %
0.0	1.0	Topsoil		0.5-1.5			spt	
	▼	W.L. 0.7' depth 10-31-67						
1.0	5.5	Clay-silt. Trace f-m sand., soft-med. plas., wet, yellow to 3.0 then gray. Alluvium.		3.5-4.5	6	CL ML		67%
5.5	6.0	Vegetation-branches, tree trunks, grass, etc. Old soil layer, organic mixed w/GM silty gravel.					spt	100%
6.0	7.0	Silty Gravel w/cobbles & some sand. Med. dense, non plas., wet-sat., gray w/some fragments of vegetation. Alluvium.		6.0-7.0	13	GM	spt	
7.0	9.0	Sandy Clay w/some fine gravel. Med. stiff, low-med. plas., wet, grnsh. gray.		7.5-8.5	12	CL	spt	
9.0	12.0	Gravel with cobbles. Med. dense to dense, non plas. sat., gray & grnsh. gray. Drove casing to 10.5'		9.5-10.5 11.0-12.0	19 49	GP	spt	
12.0	14.5	Shale-highly weathered. Recovered as: Clayey Gravel, dense, low plas. fines, wet-sat., olv. grn. & gray. Angular to subround., Fe sta'd. Drove casing to 14.0'	refusal 14.5	12.5-13.5 13.5-14.5	46 73	GC		
14.5	16.5	Shale & rubble of shale, soft to very soft, moist, dk. gray, Fe stained, mud (gouge) seams of parent shale, soft white mineral coatings, very highly fractured.					Rcd.	90%
16.5	21.0	Shale w/thin interbedded sandstones. Shale soft, moist, dk. gray. Sandstone mod. hd. to hd., moist, dk. gray, fine & argillaceous. All mod. fractured, mod. weathered.						100%
21.0	25.0							100%
25.0		Bottom of hole						
		Water pressure tests						
		0.0-6.0 1.0'H K-0.59	17.0-22.0 42.5'H K-5.5					
		10.5-14.5 1.0'H K-6.6	17.0-22.0 42.5'H K-3.3					
		14.0-25.0 1.0'H K-12.3	14.0-18.9 38.0'H K-7.7					
		22.0-25.0 31.0'H K-9.4	18.9-25.0 38.0'H K-6.1					
		22.0-25.0 31.0'H K-7.8	14.0-25.0 21.8'H K-8.7					
		Samples: 1 U 1.0'-3.0'						
		2 U 3.0'-5.0'						
		U samples taken from alternate hole.						

DH 23 Elev. 2421.5 C/L Dam Sta. 8+43 Rng. 0+00

					U S C	S	Type Bit	Rec. %
0.0	1.0	Topsoil-Boulders in setup area. Some exceeding 3' maximum dimensions, generally of conglomeratic sandstone.					spt	
1.0	3.5	Boulders exceeding 50% by volume of conglomeratic sandstone. Remainder: CL Sandy Clay med. stiff, med. plas., moist, brn. Drove casing to 5.0'					spt	
5.0	9.8	Drove casing to 9.8'					Rcd.	50%±
	▼	W.L. 7.3' depth 11-7-67						
9.8	11.8	Tricone-drove casing to 11.8					Tricone	
11.8	16.0	Sandstone Boulders exceeding 50% by volume w/clay seams. Sandstone fault rubble-fine grain, well cemented, hard, gray & olv., clay binder is sandy, med. stiff to stiff, med. plas., moist, brn.					Rcd.	79%
16.0	21.0	Sandstone to approx. 17' depth, fine, massive, gray, hard, well cemented. At 17.0; change to: Shale, soft, moist, dk. gray, rubbly, w/gouge or mud seams of parent shale. Lost water @ 19 feet. Hole caving @ 18 feet. Drove casing to 21'						38%
21.0	26.0	Shale-same as above, rubble & gouge prominent Drove casing to 25.5' depth						34%
26.0	31.0							32%
31.0	36.0	Same as above w/soft white mineral slickensides Drove casing to 30.5' depth						80%
36.0	41.0	Shale rubble & gouge dip to 50° changing to 7° some thin f. sandstones.						40%
41.0	45.5	Same as above, rubble, slickensides-polished.						89%
45.5		Bottom of hole						
		Water pressure tests						
		11.8-16.0 48.9'H K-6.1	30.5-45.5 51.2'H K-3.2					
		11.8-21.0 41.9'H K-7.2	36.0-41.0 51.2'H K-5.6					
		21.0-26.0 37.6'H K-12.0	41.0-45.5 65.0'H K-0.53					
		25.5-31.0 21.1'H K-21.0	30.5-50.0 44.2'H K-2.9					
		30.5-36.0 65.0'H K-0.8	0.0-11.8 3'H K---					
		30.5-41.0 46.6'H K-4.2						
		Samples: 23.1 sds 11.8'-16.0'						

DH 201 Elev. 2449.2 Dam Sta. 1+84 Rng. 0+96 left
Spwy. Sta. 4+96 Rng. 0+16 left

					U S C	S	Type Bit	Rec. %
0.0	0.5	Topsoil w/scattered boulders to 3' maximum dimen.						
0.5	3.5	Sandy Clay w/some f. gravel (<15% & <3/4") Med. stiff, med. plas., moist, brown, residuum.		2.0-3.0	7	CL	spt	
3.5	8.0	Silty Clay-med. stiff to stiff, med. plas., moist, redsh. brn., v. stiff from 6.0'; residuum & saprolite of shale.		5.0-6.0 6.5-7.5	21 35	CL	spt	
7.5	9.0	Shale-highly weathered w/thin mod. hd. siltstones. Soft, Fe stnd. reds & yels., thin bedded lamellar compaction shale, clay & silt base, highly jointed & fractured generally at low angle. Set casing to 5.0' reamed to 9.0'		8.0-9.0	42		spt Tricone	
9.0	12.0			9.5-10.5 11.0-12.0	20 88		spt Tricone	
		Set casing to 12.0' & cleaned hole						
12.0	17.0	Shale-highly weathered, soft, gray & Fe stnd. reds & yels., moist, thin bedded occ. thin siltstone. Highly jointed & fractured w/clay coatings and mud seams.					Rcd.	94%
17.0	21.0	Color now predom. grnsh. gry.					Rcd.	100%
21.0	26.0	Shale-slightly weathered some Fe stns. on joints. Soft, gray, thin bedded w/occ. thin siltstone dip approx. 7°						100%
	▼	W.L. 26.0' depth 10-2-67 Elev. 2423.2						

DH 201 (continued)

			U S C	S	Type Bit
26.0	31.0	26.0 to 27.1 same as above. 27.1-31.0 sandy shale w/thin interbeds of f. SS & shale, soft to mod. hard, med. to dk. grey.			
31.0	36.0	Shale w/scattered thin f. sandstones, soft-med. hd., moist, gray, thin bedded dip 5-7°. Jointed & fractured @ bedding planes highly Fe stnd.			
36.0	39.5	Shale silty w/f. sand, soft to mod. hd., moist, lt. gry., thin bedded-low angle dip			
39.5	41.5	w/soft clay like seams			
41.5	45.5	Conglomeratic sandstone, white w/slt. Fe stns. thruout. Steep to vertical joints w/clay coatings and Fe stains. Composed of rounded & lenticular quartz pebbles & M-C qtz. sand., mod. to well cemented w/silica or Fe.			
45.5	50.5	Conglomeratic sandstone same as above w/increase in Fe staining.			
50.5	55.5	Decrease in iron staining.			
55.5	59.5	Sandstone some what finer grain w/less Fe stains. Color change to lt. gray. Well cemented-hard mod. to highly jointed. Near vertical & horizontal Planes Fe stained & clay coated.			
59.5	64.0	Sandstone fine grained, layered grnsh. gry. & med. gry. Hard, well cemented moderately jointed vertical & horizontal.			
64.0	67.0	Lighter color, more broken, Fe stains & mud seams, lost core probably in mud seam or very shoft shale seam.			
67.0	72.0	Sandstone, fine grained, hard-well cemented, lt. gry., moderately fractured vert. & hori., Fe stained, sand f-m grain dip 6°. 68.5-70.9			
72.0	77.0	Sandstone fine grain, gray, hard, well cemented, massive, generally sound and intact.			
77.0		Bottom of hole			
		Water pressure tests			
		5.0-9.0 7'H K-0.23	12.0-33.0 16.5'H K-10.3		
		12.0-26.0 16.5'H K-6.24	29.2-34.2 37.3'H K-10.8		

DH 309 Elev. 2407.8 Dam Sta. 9+84 Rng. 0+57 rt.

					U S C	S	Type Bit	Rec. %
	▼	W.L. 1.2' 10-6-67						
0.0	1.0	Topsoil - Boulders to 3' maxi, dimen. in setup area.		0.5-1.5	43		spt	
1.0	7.0	Boulders to 50% volume in matrix of: silty clay w/some fine sand. Matrix is soft, low plas., very wet, gray. Blow count is high due to boulders. Boulders are of coarse & fine grained sandstone hard to very hard, angular, well cemented.		3.5-4.5 5.0-6.0 6.0-7.0	16 7 5	CL	spt	
7.0	11.6	Clayey Gravel w/some sand & silt med. dense, low plas. fines, wet, gray, gravel fine to coarse, angular of fine sandstone.		8.0-9.0 9.5-10.5	21 45	GC	spt	
11.6	13.0	Shale-highly weathered, soft, moist, gray & iron stained, thin bedded, highly fractured. Drove casing to 13.0'	refusal 13.0	12.0-13.0	66		spt	
13.0	15.0	Shale w/interbedded sandstones-highly weathered shale soft, moist, dk. gray, thin bedded. Sandstone, mod. hd. to hd., dk. gray, thin bedded, fine. All highly fractured & jointed iron stained.						Rcd.
15.0	19.0	Shale-soft, dk. gray, moist, thin bedded, low angle dip w/thin mud seams of parent shale, highly jointed & fractured.						
19.0	24.0							
24.0	28.0	Slightly more intact, slickensides-pyrite						
28.0	33.0	Shale w/thin interbedded sandstones. Shale soft, moist, dk. gray, thin bedded dip 5-10° Sandstone mod. hd. to hd., dk. gray, thin bedded, fine, argillaceous. All moderately fractured & jointed.						
33.0	38.0							
38.0		Bottom of hole. Water pressure tests:						
		1.0-6.0 1'H K-2.25	29.5-34.5 34.6'H K-0					
		13.0-19.0 1'H K-5.91	25.0-38.0 35.6'H K-0.18					
		13.0-24.0 1'H K-20.8	23.5-38.0 35.6'H K-0.72					
		34.5-38.0 35.6'H K-0						

DH 310 Elev. 2407.0 Dam Sta. 10+00 Rng. 0+00

					U S C	S	Type Bit	Rec. %
0.0	0.5	Boulders in setup area range to 3' maximum dimension. Topsoil.					spt	
	▼	W.L. @ Ground Level						
0.5	7.5	Evidence from nearby test pits indicated boulders & cobbles to 25% of total volume. From split spoon: Sandy Silt w/ang. gravel frags. Loose to med. dense, low plas., moist, yel. brn. change to gray @ 6.0'. Boulders & cobbles influence penetration resistance testing.		0.5-1.5 2.0-3.0 3.5-4.5 5.0-6.0	17 12 22 18	SM		
7.5	12.0	Gravelly sand w/some silt, med. dense, non plas., wet, olv. gry. ang. & rnd. f-c gravel, c. sand.		8.0-9.0 11.0-12.0	21 29		spt	
12.0	13.5	Shale, gray w/iron stains, soft, moist, highly weathered, highly fractured and jointed. Drove casing to 13.5'		12.5-13.5	77		spt	
13.5	16.5	Shale, highly weathered, thin bedded, soft, gray, moist, highly jtd., mud seams, dip 25°.						Rcd.
16.5	20.0	Shale-highly weathered-faulted-soft, gray, moist, thin bedded. Rubble & mud seams, slickensided white, mineral coating on slick & joint planes. Dip changes.						
20.0	23.5	Dip @ 10-15°.						
23.5	25.0	Increase white mineral dip @ 25'-7°.						

From	To	DH 310 (continued)		N	USCS	Type Bit Used	Rec. %
25.0	28.0	Shale w/thin interbedded f. sandstones, soft to med. hard, moist, dk. gry., white mineral coatings & scattered slickensides increasing sandstone % below 27.7'					100%
28.0	33.0	Interbedded f. sandstones & shales. Shales soft, gray, moist. Sandstone fine, mod. hd. to hd., thin bedded, 7° dip moderately fract. occ. slickenside. Jointed along bedding.					100%
33.0	38.0	Same as above, no white mineral, little evidence of fault. Relatively sound rock.					100%
38.0	43.0						100%
43.0		Bottom of hole					

Water pressure tests

13.5-16.5 2.0'H K=1.6	20.5-25.5 47.2'H K=0.48
25.5-30.5 39.1'H K=5.3	25.5-43.0 40.3'H K=2.6
35.5-43.0 47.2'H K=0.2	25.5-43.0 40.3'H K=1.5
30.5-35.5 47.2'H K=1.3	13.5-43.0 42.6'H K=2.2
20.5-25.5 47.2'H K=2.86	0.0-6.0 2.0'H K=---

DH 311 Elev. [illegible]03.9 Dam Sta. 10+35 Rng. 1+28 left

From	To	Description	Sample	N	USCS	Type Bit Used	Rec. %
0.0	0.5	Topsoil. Boulders exceeding 3' maximum dimen. near setup area.	0.5-1.5	2			
0.5	4.0	Sandy Silt w/some angular gravel; very loose, low plas., wet, gray, sand is fine grained. Nearby test pit indicated as much as 50% boulders by volume in this horizon. W.L. was 1' depth before first run w/core bbl.	3.0-4.0	2	SM	spt	
4.0	10.5	Silty Sand w/some ang. gravel med. dense to dense, low plas. fines, wet, gray.	6.5-7.5 8.0-9.0 9.5-10.5	14 71 40	SM ?	spt	
10.5	12.0	Shale-highly weathered	11.0-12.0	90		spt	
12.0	17.0	Shale-soft, dk. gray, moist, thin bedded, dip 7°-10°, highly joint. & fract.-mud seams.				Rcd.	94%
17.0	19.0						85%
19.0	24.0						100%
24.0	28.0	Shale-same as above only less fractured.					100%
28.0	33.0	Shale-soft, dk. gray, moist, thin bedded, dip 7°-10°, moderately jointed & fractured vertical & horizon., some mud seams of parent shale. Now w/some slickensides & white mineral coating on joints & slicks.				Rcd.	90%
33.0	37.5	Increase in slicks, mud seams (rubble or gouge) & increase amount of white mineral.					100%
37.5	41.7	Shale-rubble-highly slickensided, fractured & broken, gouges or mud seams of parent shale, soft, dk. gray, moist, white mineral coatings.					55%
41.7	43.5						57%
43.5	46.5						97%
46.5	51.5	Same as above to 47.7' - @ 47.7 Shale, soft, moist, dk. gray, thin bedded, fossil zone, moderately broken w/scattered slickensides white mineral coating on slicks & joints relatively sound rock.					92%
51.5	52.0	Shale-soft, dk. gray, moist, thin bedded, moderately broken w/scattered slickensides, white mineral coatings, relatively sound rock.					120%
52.0	57.0	Some iron stains.					
57.0		Bottom of hole.					
	▼	W.L. has Artesian Head of estimated 5' above level. (Artesian conditions were continuing Jan. 68.)					

Water pressure tests

52.0-57.0 34.6'H K=0.6	31.5-36.5 69'H K=1.4[illegible]
48.0-53.0 46.2'H K 0.5	26.5-57.0 69'H K=0.78
36.5'57.0 69'H K=0.7?	21.5-26.5 57'H K=2.17

DH 620 Elev. 2404.8 Dam Sta. 10+80 Rng. 0+65 rt.

From	To	Description	Sample	N	USCS	Type Bit Used	Rec. %
0.0	0.5	Topsoil	0.5-1.5	2			
0.5	4.5	Clay-silt w/some v. f. sand, soft, low to med. plas., wet, lt. gray w/iron stains - alluvium.	3.5-4.5	6	CL ML	spt	
4.5	6.0	Clayey Gravel w/some f.-c. sand. Loose to med. dense, low-non plas. fines, wet to sat. gray & gray brn	5.0-6.0	13	GC	spt	
6.0	10.5	Sandy silt w/trace angular gravel sand, fine, med. dense, low plas., wet, gray.	8.0-9.0	21	SM	spt	
10.5	12.0	Lean Clay w/trace sand & gravel, med. stiff, med. plas., wet, grnsh. gray.	11.0-12.0	15	CL	spt	
12.0	13.5	Gravel & cobbles-angular, fine to coarse, med. dense, non plas., wet to sat., grnsh. gray.	12.5-13.5	24	GP	spt	

AS BUILT

LOGS OF TEST HOLES
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed C. Johnson
Drawn C. Taylor
Traced
Checked

Approved by
Title
Title

Sheet 22 Drawing No. MD-407-[illegible]

PLATE NO. 10

DH 620 (continued)

13.5	14.8	Weathered shale	refusal 14.8				spt	
14.8	18.8	Shale w/thin interbedded sandstones. Shale soft, gray, thin bedded, moist. Sandstone mod. hd. to hd., moist, dk. grey - fine.					Rcd.	95%
18.8	23.5	Shale w/thin interbedded sandstones, same as above, moderately jointed-mod. weathered.						88%
23.5		Bottom of Hole						
	▽	W.L. - Artesian flow above ground level, estimated 3-5' above ground.						
		Water pressure tests						
		0.0-6.0 0.7'H K=0.3	0.0-12.0 0.3'H K=10.8					
		As attempt was made to take undisturbed samples @ 7.5 to 9.5 and 10.0 to 12.0 but there was too much gravel to push sampler.						

DH 621 Elev. 2404.8 Dam Sta. 11+70 Rng. 0+52 rt.

0.0	1.5	Topsoil	0.5-1.5	2			spt	
	▽	W.L. 1.4' depth 11-1-67						
1.5	5.5	Silt-Clay w/some fine-med. sand. Loose, low plast. wet, gray, some grass vegetation @ 4.5' depth.	2.0-3.0	3	ML		spt	
			3.5-4.5	3	CL			
5.5	9.0	Silty Gravel w/some flaggy cobbles. med. dense, low-non plas. fines, wet-sat., graysh. grn. of shale & siltstone fine to coarse, angular. Some fine to coarse sand.	5.0-6.0	10	GM		spt	
			6.5-7.5	14				
			8.0-9.0	34				
9.0	11.3	Shale-highly weathered, soft to very soft, moist, gray, iron stained, thin bedded, very highly jointed. refusal 11.3	9.5-10.5	43			spt	
11.3	13.5	Interbedded shales & sandstones. Shale, soft dk. grey, moist, thin bedded, SS med. hd. to hd., dk. gray, thinbedded, f. arg. All mod. weath., highly jtd. @ bedding & steep relief jts. Fe stained. Dip 5-10°.					Rcd.	91%
13.5	18.5							84%
18.5	23.5	Slightly more intact.						94%
23.5		Bottom of Hole						
		Water pressure tests						
		0.0-6.0 1.4'H K=120.0	11.3-18.5 0.8'H K=35.0					
		0.0-11.3 1.4'H K=76						

DH 622 Elev. 2404.6 Dam Sta. 11+95 Rng. 1+03 rt.

0.0	0.5	Topsoil					
0.5	5.5	Clay-Silt, very soft, low-med. plas., very wet, brns., grays alluvium.	0.0-3.0	0		spt	
			3.0-4.6	2	CL		
			4.6-5.5	2	ML		
	▽	W.L. 0.6' depth 11-1-67					
5.5	6.5	Silty Gravel w/clay some fine to coarse sand, med. dense, low plas. fines, wet, graysh. grn., fine to coarse, angular.	5.5-6.5	9	GC GM		
6.5	8.0	Shale-highly weathered, soft, moist, grnsh. gray, highly jtd.	6.5-7.5	9		spt	
			7.5-8.0	50			
8.0		Bottom of Hole					
		Water pressure tests					
		0.0-6.0 0.6'H K=4.3					

DH 623 Elev. 2404.6 Dam Sta. 11+46 Rng. 0+53 left

0.0	1.0	Topsoil	0.5-1.5	2			spt	
	▽	W.L. 1.0' depth 11-3-67 (in overburden).						
	▽	W.L. 0.2' depth after breaching bedrock.						
1.0	4.5	Silt-Clay, soft, low-med. plast., wet, grays & brns., iron stained.	2.0-3.0	2	CL		spt	80%
			3.5-4.5	2	ML			
4.5	6.0	Silty Sand-loose to med. dense, low plas. fines, very wet, gray, slightly to mod. organic w/vegetation fragments.	5.0-6.0	7	SM		spt	87%
6.0	10.5	Clayey Gravel w/cobbles, med. dense, non plas., wet, brns. & grays, ang. to subrounded, iron stained.	6.5-7.5	13	GC			
			8.0-9.0	21	GM			
			9.5-10.5	14				
10.5	16.5	Shale-highly weathered, very soft, moist to wet, gray & gray grn. Recovered as CC-Clayey Gravel, med. dense to dense, low-med. Plas. fines, wet. Drove casing to 15.0'	11.0-12.0	17			spt	
			14.0-15.0	53				
			15.5-16.5	90				
16.5	18.5	Shale-highly weathered, very soft, rubble & gouge, moist, dk. gray & graysh. grn. thin bedded, dip obliterated estimated 10°-15°, mud seams or gouge of parent shale.					Rcd.	100%
18.5	23.5	Shale, soft, moist, dk. gray, mod. weathered, highly jointed & fract. vertical & horizon. Becoming sandy @ 23.0						92%
23.5	28.5	Shale w/interbedded sandstones. Shale soft, moist, dk. gray, thin bedded. Sandstone mod. hd. to hd., moist, dk. gray, thin bedded fine grained, argillaceous. All moderately jointed, slightly weath.						100%
28.5		Bottom of Hole						
		Water pressure tests						
		0.0-6.0 1.0'H K=2.6						
		Samples: 1 U 2.0'-4.0'						
		2 U 4.0'-5.6'						
		Shelby undisturbed samples taken from alternate hole.						

DH 624 Elev. 2404.9 Dam Sta. 10+75 Rng. 0+60 left

0.0	1.0	Topsoil	0.5-1.5	3			
1.0	3.0	Silty Clay, soft, med. plas., moist, brown.	2.0-3.0	4	CL	spt	
	▽	W.L. 1.1' depth 11-3-67					
3.0	5.5	Silty Sand w/roots, loose, low plas., wet, gray, sand fine.	3.5-4.5	6		spt	

DH 624 (continued)

5.0	9.5	Silty Sand w/some gravel & flaggy cobbles, med. dense, low-non plas., very wet, sand fine, gravel angular fine to coarse.	6.5-7.5	19			
			8.0-9.0	32			
9.5	10.5	Shale-sandy-highly weathered, soft to med., moist, gray, thin bedded.	9.5-10.5	100			
10.5		Bottom of Hole					
		Water pressure tests					
		0.0-6.0 1.1'H K=0.97	8.0-10.5 1.1'H K=3.9				

TP 56 Elev. 2447.3 Dam Sta. 16+90 Rng. 0+15 left

0.0	0.3	Topsoil, duff, surface cobbles & boulders.	
0.3	2.5	Cobbles & boulders 50%+ to 2 ft. maxi. Remainder: Sandy Clay w/silt-med. stiff, med. plas., moist, brn. coarse mat'l angular & sub ang., well graded, mod. permeable - colluvium.	CL
2.5	13.5	Silty Sand-med. dense to dense, moist (sat. @ 13.4'), non plas., iron brn. & tan, sand fine, rnd., qtz., occ. "dirty" zones, occ. thin clay, mod. perm., cobbles of sandstone 6" to 8'.	SM
	▽	W.L. 13.4' 10-19-67	
13.5	14.0	Sandstone-white, saturated & producing, quartz highly fractured w/no pattern K=5.	
14.0		Bottom of Hole	

TP 68 Elev. 2441.0 Dam Sta. 6+45 Rng. 0+05 Rt.

0.0	2.5	Clayey Silt w/scattered SS. cobbles, med. stiff, sl. plas., moist, tan, residuum-colluvium.	ML
2.5	6.0	Lean to Fat Clay, stiff, med. to high plas., moist, red brn. in 6" layers between 4" seams of SS cobbles - residuum.	CL CH
6.0	10.0	Lean to Fat Clay (weathered shale?), stiff, highly plastic, moist, red brn., residuum Jennings.	MH CH
10.0	-	Siltstone, dark olive, can scratch w/fingernail but refusal to backhoe, conchoidal fracture.	
10.0		Bottom of Hole	
		Dry Hole	

TP 69 Elev. 2422.6 Dam Sta. 8+40 Rng. 0+27 Lft.

0.0	4.0	Boulders of conglomeratic sandstone to ½ cu. yd. mostly less than ¼ cu. yd. Angular, blocky, w/some black topsoil & tan clayey silt in upper 2'. Rock appears to be in place from 2.5 to 4.0 - refusal at 4.0' Jennings.
4.0		Bottom of Hole

TP 70 Elev. 2416.8 Dam Sta. 8+81 Rng. 0+39 Lft.

0.0	4.5	Boulders of conglomeratic sandstone, mostly ¼ to ½ cu. yd., some to 1 cu. yd. Angular, blocky-mixed w/some topsoil & tan clayey silt - refusal @ 4.5 on sandstone.
4.5		Bottom of Hole

TP 71 Elev. 2411.2 Dam Sta. 9+10 Rng. 0+37 Lft.

0.0	5.0	Boulders of sandstone to ½ cu. yd. in black topsoil & tan clayey silt.
5.0	6.0	Siltstone - Jennings - dark olive, blocky, broken.
6.0		Bottom of Hole
		Dry Hole

TP 72 Elev. 2408.1 Dam Sta. 9+24 Rng. 0+25 Lft. (upper end)
Elev. 2407.4 Dam Sta. 9+24 Rng. 0+25 Lft. (lower end)

0.0	1.5	Topsoil, roots & vegetation.	
1.5	2.5	Cobbles & Boulders 50% by volume in matrix of Silty Clay, soft, mod. plas., wet, white & tan.	ML CL
2.5	7.0	Cobbles & Boulders 60% by volume to 3' maxi. dimension. Remainder: Clayey Gravel w/fine to coarse sand. Dense, non plas., moist to wet, yel. & tan, difficult to excavate.	GC
7.0	12.5	Lean Clay or highly weathered shale - Jennings, very stiff, med. plas., wet, grnsh. gray, (depth from 7.0 to 12.5 only at lowest end of pit nearest stream, this depth had perm. rate of 1 gpm).	CL
12.5		Bottom of Hole	
	▽	W.L. varied in this long pit ranging from floodplain part way up slope.	

TP 151 Elev. 2422.7 Bor. Area 1 B/Li Sta. 0+00 Rng. 1+65 left

0.0	0.5	Topsoil - duff	
0.5	6.5	Silty Clay w/25% sand. w/trace ang. gravel very stiff, med. plas., moist @ 2'-15% @ 6'-15.2% moisture, brn., gravel & sand of shale frags. low perm. residuum & colluvium.	CL
6.5	8.0	Shale - weathered, green & yellow brn., moist, massive - No visible bedding but clay films on fractures - Jennings.	
8.0	12.1	Shale - med. weath., fractured & clay fi	
12.1		Bottom of Hole	
		Dry Hole	
		Samples: 151.1 1de 0.5'-6.5'	

								Type	
							C	Blt	Sec.
							H	Hand	T
...ay	6.5-7.5	19							opt
...plas.,	8.0-9.0	32							
...gular									
	9.5-10.5	100							opt
...in									
...10.5 1.1'B K=3.9									
...3 left									
...e & boulders.									
...ft. maxi.								CL	
...med. stiff,									
...e mat'l									
...med, med.									
...se, moist								SM	
...own brn. &									
...conc.									
...y, med,									
...8' to 8'.									
...producing,									
...pattern H-5.									
...ft.									
...cobbles, med.								ML	
...e, residuum-									
...to high plas.,								CL	
...between 4" seams								CH	
...shale?), stiff,								MH	
...rm., residuum								CH	
...scratch									
...backhoe,									
...7 Lft.									
...ndstone to									
...cu. yd.									
...h topsoil &									
...Rock appears to									
...- refusal at 4.0'									
...9 Lft.									
...ndstone,									
...to 1 cu. yd.									
...e topsoil &									
...4.5 on sandstone.									
...7 Lft.									
...m. yd. in									
...dit.									
...olive.									
...3 Lft. (upper end)									
...Lft. (lower end)									
...lome in matrix								ML	
...lay., wet, white								CL	
...lome to 3' maxi.									
...Gravel w/fine								GC	
...plas., moist to									
...to excavate.									
...ed shale -								CL	
...plas., wet, grnsh.									
...only at lowest									
...this depth had									
...ranging from									
...ft.									
...+00 Sta. 1+65 left									
...ium sand, gravel								CL	100%
...0.9 7'-15%									
...gravel & sand of									
...ium & colluvium.									
...yellow brn., moist,									
...hard clay films									
...and & clay fi...									

TP 152 Elev. 2439.2 Bor. Area 1 B/L 1 Sta. 3+43 Rng. 3+19 left

				Type	
			C	Blt	Sec.
			H	Hand	T
0.0	0.6	Topsoil - duff. Surface cobbles & boulders to 3'.			
0.6	3.6	Sandy Clay w/silt 10% volume cobbles, med. stiff to stiff, low plas., moist, lt. brn. coarse sand'l. sandstone, qtz. & shale, sub rnd. No structure - residuum & colluvium.	CL SC		100%
3.6	10.7	Clayey Gravel or gravelly clay w/5% +3", very [illegible], sand, plas., moist, dk. olv. brn, lt. brn., & gray's in [illegible] grab shale & in sandy [illegible] Easy to excavate. No [illegible] Lab analysis. No [illegible]	GC CL		100%
10.7	11.9	Shale - weathered - highly fractured, soft (h-3), olive green, silty & clayey, massive.			
11.9		Dry Hole Bottom of Hole Samples: 152.1 lds 0.0'-3.6' 152.2 lds 3.6'-10.7'			

TP 153 Elev. 2414.7 Bor. Area 1 B/L 1 sta. 3+50 Rng. 1+53 left

0.0	0.8	Topsoil - duff.			
0.8	3.6	Clayey silt 10% cobbles & boulders to 2' maxi. dimen., med. stiff, low plas., moist, mottled brns., some f. sand, colluvium.	ML CL		100%
3.6	5.5	Silty sand, occ. cobble of sandstone 5%, med. dense, sl. plas., dry, mottled brns. & gray, massive, alluvium.	SM		100%
5.5	9.4	Sandy silt, med. dense, sl. plas., moist, olv. brn.-yel. brn., massive, sand fine to med. colluvium & residuum.	ML		100%
9.4	10.4	Shale - weathered - wet, green & gray.			
10.4		Bottom of Hole Dry Hole Samples: 153.1 lds 0.8'-3.6' 153.2 lds 3.6'-5.5' 153.2 lds 5.5'-9.4'			

TP 154 Elev. 2425.5 Bor. Area 1 B/L 1 sta. 5+07 Rng. 3+08 left

0.0	0.5	Topsoil - duff.			
0.5	6.5	Silty Clay w/some soft shale gravel. Stiff, med. plas., moist, brn., & gray, massive, residuum.	CL		100%
6.5	8.1	Shale, olive w/some grey, sl. moist, fractured silty - h-3 Jennings.			
8.1		Bottom of Hole Dry Hole Samples: 1ds 0.5'-6.5'			

TP 155 Elev. 2425.2 Bor. Area 1 B/L 1 sta. 7+02 Rng. 2+12 left

0.0	0.5	Topsoil - duff.			
0.5	1.5	Clayey Gravel, med. dense, med. plas., v. moist, brn. & olv., gravel is soft weath. shale, residuum.	GC		
1.5	7.0	Shale weathered & highly fractured, moist to wet, soft (h-3) olv. grn., clay films on fractures, Jennings.			
	▼	W.L. 6.8' 11-2-66			
7.0		Bottom of Hole			

TP 156 Elev. 2422.1 Bor. Area 1 B/L 1 sta. 8+40 Rng. 1+05 left

0.0	0.8	Topsoil - duff.			
0.8	3.9	Clayey silt, med. dense, med. plas., moist, brn. w/gray mottling, residuum.	MH		100%
3.9	5.8	Shale - weathered, highly fractured. Olive w/iron stains, soft (h-2), moist. Jennings. Easy to excavate.			
5.8		Bottom of Hole Dry Hole Samples: 156.1 lds 0.8'-3.9'			

TP 157 Elev. 2418.6 Bor. Area 1 B/L 2 sta. 0+20 Rng. 1+30 left

0.0	0.7	Topsoil - duff.			
0.7	2.5	Silty clay w/15% cobbles & boulders, maximum dimension 3', med. stiff to stiff, med. plas , moist, brn., massive, colluvium.	CL		100%
2.5	10.0	Clayey Gravel, 5% cobbles, dense, med. plas., moist, brns. w/iron stains, coarse fraction sandstone, quartzite, & shale. (Speedy-13.8% @ 9') residuum & colluvium.	GC		100%
10.0	11.0	Shale - weathered, very soft (H-1) wet, olive, massive.			
11.0		Bottom of Hole Dry Hole Samples: 157.1 lds 0.7'-2.5' 157.2 lds 2.5'-10.0'			

AS BUILT

LOGS OF TEST HOLES
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	
Designed F. Hoover	Approved by
Drawn C. Taylor	Title
Traced	Title
Checked	Work Unit No.

PLATE NO. II

TP 158 Elev. 2419.7 Bor. Area 1 B/L 2 sta. 1+75 Rng. 1+90 left

			USC	Type Bit Rec. Used %
0.0	0.6	Topsoil - duff.		
0.6	4.6	Silty Clay w/some sand & trace gravel med. stiff to stiff, med. plas., moist, brn., & iron stained, coarse mat'l qtzt., SS, & shale (speedy-15.6 @ 3.5') colluvium & residuum.	CL	100%
4.6	7.1	Shale - weathered - highly fractured, green, moist, soft (h-2) massive, Jennings.		
7.1		Bottom of Hole Dry Hole Samples: 158.1 lds 0.6'-4.6'		

TP 159 Elev. 2420.4 Bor. Area 1 B/L 2 sta. 3+05 Rng. 2+45 left

0.0	0.5	Topsoil - duff occ. qtzt. boulder.		
0.5	5.6	Silty clay w/20% sand & trace gravel, med. stiff to stiff, med. plas., moist, brn. w/iron stains, massive, coarse mat'l. sandstone & shale, colluvium & residuum.	CL	
5.6	7.0	Shale - weathered - highly fractured, moist, green, soft, Jennings.		
7.0		Bottom of Hole Dry Hole		

TP 160 Elev. 2412.7 Bor. Area 1 B/L 2 sta. 4+10 Rng. 1+70 left

0.0	0.3	Topsoil & duff.		
0.3	3.7	Silty Clay w/trace sand., med. stiff, med. plas., very moist, mottled brns., (speedy-35.8% @ 2.0') alluvium	CL	100%
3.7	6.7	Clayey Silt w/some sand & trace gravel, loose, low plas., wet to sat., (speedy-18.4% @ 4') coarse fraction - sandstone & shale.	ML	
	▼	W.L. est. @ 6.7'		
6.7	9.8	Silty Sand w/some gravel, med. dense, non plas., saturated, dk. brn., coarse mat'l qtzt., SS & shale, caving, alluvium.	SM	
9.8	11.8	Shale - highly weath. - highly fractured, soft, moist, green, altered to CL or CH @ base.		
11.8		Bottom of Hole Samples: 160.1 lds 0.3'-3.7'		

TP 161 Elev. 2430.5 Bor. Area 1 B/L 2 sta. 2+05 Rng. 3+83 left

0.0	0.5	Topsoil & duff.		
0.5	2.5	Silty Clay w/some gravel & sand w/10% cobbles, med. stiff to stiff, med. plas., moist, lt. brn, massive, residuum.	CL	
2.5	6.5	Sandy Shale, weathered - fractured. Soft to mod. (h-3.5), dry, olive w/gray clay films. Sand is v.v. fine. Jennings.		
6.5		Bottom of Hole Dry Hole		

TP 162 Elev. 2434.2 Bor. Area 1 B/L 1 sta. 8+40 Rng. 2+54 left

0.0	0.5	Topsoil & duff. Boulders to 2.5'max. dimen.		
0.5	4.0	Clayey Sand w/5% cobbles, med. dense, moist, gray & brns., massive, coarse mat'l of sandstone & quartzite, sub ang. to sub rnd. some SMs & CLs - colluvium.	SC	100%
4.0	7.6	Silt & Clay (wea. shale) w/trace shale gravel very stiff, plastic, moist, bluegray & grnsh. brn., massive, unctuous. Jennings.	CH MH	100%
7.6	9.6	Shale - weathered - fractured, olive, H-2-3		
9.6		Bottom of Hole Dry Hole Samples: 162.1 lds 0.5'-4.0' 162.2 lds 4.0'-7.6'		

TP 163 Elev. 2416.1 Bor. Area 1 B/L 1 sta. 5+70 Rng. 1+40 left

0.0	0.6	Topsoil - duff.		
0.6	3.8	Silty Clay w/trace shale gravel, med. stiff, med. plas., moist (ext. 17%), brns. & gray, massive, residuum.	CL	100%
3.8	5.2	Shale - highly weathered - fractured, olive green, sl. moist, soft to mod. (H-3), clay films on fracture surfaces. Excavates w/ease.		
5.2		Bottom of Hole Dry Hole Samples: 163.1 lds 0.6'-3.8'		

TP 164 Elev. 2431.9 Bor. Area 1 B/L 1 sta. 3+17 Rng. 3+70 left

0.0	0.4	Topsoil & duff w/cobbles and boulders to maximum dimension of 2.5'.		
0.4	4.0	Silty Clay w/15% sand, 15% gravel occ. cobble very stiff, med. plas., moist, brns., coarse mat'l is quartzite, sandstone & shale.	CL	100%
4.0	9.0	Clayey Gravel w/5% cobbles. Dense, med. plas. moist, lt. brn. w/iron stains, coarse mat'l is sandstone, quartzite & some shale, semi - stratified, colluvium.	GC	
9.0	10.6	Shale - weathered - fractured, olive green, moist, soft (h-2).		
10.6		Bottom of Hole Dry Hole Samples: 164.1 lds 0.4'-4.0'		

TP 202 Elev. 2439.8 Bm. Splwy. Sta. 2+26 Rng. 0+95 Rt.

0.0	1.0	Topsoil & vegetation.		
1.0	3.0	Lean Clay w/trace sand & gravel, stiff, med. plas., moist, yel. brn., occ. cobble - colluvium.	CL	
3.0	7.5	Silty Clay w/10% volume siltstone, cobbles & boulders, some gravel, stiff, med. plas., moist, yel. brn. - residuum.	CL	
7.5	8.5	Lean clay, med. stiff, med. to high plas., moist, pinkish, residuum.	CL	

TP 202 (continued)

8.5	11.0	Siltstone-weathered & fractured, Jennings, olv. green, excavates as 35% flaggy cobbles; remainder Clayey Gravel. Dense, med. plas., moist.	
11.0	11.5	Siltstone-med. weathered & fractured, more resistant than above.	
11.5		Bottom of Hole Dry Hole	

TP 208 Elev. 2443.7 Bm. Splwy. Sta. 1+40 Rng. 0+80 Left

0.0	1.0	Topsoil & vegetation.	
1.0	5.5	Lean Clay w/15-20% sand & gravel. & 10% blocky boulders. Hard, med. plas., sl. moist, brn., massive, residuum, colluvium.	
5.5	8.5	Clayey Gravel-Gravelly Clay w/soft to mod. siltstone flags. Hard, med. plas., dry, brn. & olv. green, residuum.	
8.5	11.5	Siltstone & shale-highly weathered. Excavates as: Clayey Gravel w/20%+ siltstone flags. Hard as soil, med. plas., fines, moist, olive green, thin to med. bedded.	
11.5		Bottom of Hole Dry Hole	

TP 210 Elev. 2438.2 Bm. Splwy. Sta. 1+71 Rng. 0+78 Rt.

0.0	1.0	Topsoil & vegetation.		
1.0	3.0	Lean Clay w/some gravel, occ. siltstone cobble flaggy, med. stiff, med. plas., moist, red brn. residuum, colluvium.		
3.0	7.5	Silty Clay w/trace sand & gravel and 10% flaggy cobbles, stiff, med. plas. moist, redsh. brn., residuum.		
7.5	11.5	Siltstone weathered & fractured, excavates as 60% siltstone cobbles. Remainder: Gravelly Clay, hard, med. plas., moist, olive & brn. Jennings.		
11.5		Bottom of Hole Dry Hole		

TP 211 Elev. 2436.7 Bm. Splwy. Sta. 0+93 Rng. 0+20 Rt.

0.0	0.5	Topsoil & vegetation, occ. sandstone boulder.	
0.5	6.5	Lean to Silty Clay w/trace sand & gravel. One cgl. sandstone boulder 3'x1.5'x1.5' soil stiff, med. plas., moist, yel. brn. massive residuum & colluvium.	
6.5	9.5	Shale-highly weathered & fractured-Jennings. Excavates as CL-GC Clayey Gravel. Dense, med. plas., moist, olv. & iron stains, gravel portion of shale which breaks down readily to produce much clay.	
9.5	10.0	Siltstone-Jennings-weathered & fractured. Excavates as 60% cobbles. Remainder CL or GC.	
10.0		Bottom of Hole Dry Hole	

TP 212 Elev. 2441.8 Bm. Splwy. Sta. 1+80 Rng. 0+05 Lft.

0.0	0.5	Topsoil, occ. sandstone cobble or boulder.	
0.5	2.5	Lean Clay w/occ. sandstone cobble, med. stiff med. plas., moist, yel. brn., residuum & colluvium.	
2.5	8.0	Silty Clay w/occ. cobble trace sand & gravel stiff, med. plas., moist, yel. brn., massive residuum.	
8.0	8.5	Siltstone-weathered & fractured. Jennings, flaggy, recovered principally as cobbles.	
8.5	11.0	Saprolite of shale-Jennings-completely weathered in place. Excavates as Lean Clay, med. stiff to stiff, med. to high plas., moist, redsh., pinks, & yel. brns.	
11.0	14.0	Shale w/interbedded arg. siltstones-Jennings highly weathered & fractured, excavates as 35-40% soft cobbles. Remainder: CL-GC Clayey Gravel, dense, med. plas., moist, olv. and brn.	
14.0		Bottom of Hole Dry Hole	

TP 213 Elev. 2445.3 Bm. Splwy. Sta. 2+77 Rng. 0+13 Rt.

0.0	0.5	Topsoil & vegetation occ. surface boulder.	
0.5	6.5	Lean Clay w/occ. cobble. Stiff, med. plas., moist, yel. brn., massive residuum & colluvium.	
6.5	11.0	Saprolite of shale-excavates as: Gravelly Clay w/35% small soft siltstone flags. Stiff to hard, med. plas., moist, olv. & brn. saprolite-residuum.	
11.0	13.5	Shale-highly weathered & fractured - Jennings. Excavates as 60% volume small soft cobbles of shale & siltstone. Remainder: Clayey Gravel, dense, med. plas., moist, olv. All coarse mat'l breaks down readily on handling.	
13.5		Bottom of Hole Dry Hole	

TP 214 Elev. 2447.8 Bm. Splwy. Sta. 4+75 Rng. 0+00

0.0	0.5	Topsoil-scattered surface boulders 2.5'	
0.5	3.0	Silty Clay w/cobbles and occ. boulders stiff, med. plas., moist, redsh. brn. colluvium.	

		USCS	Type Bit Rec. Used %
...ctured, ...ovates as 35% ...r Clayey Gravel. ...& fractured, ...e.		GC	
...440 Rng. 0+80 Left			
...& gravel. & 10% ...med. plas., sl. ...iduum, colluvium. ...clay w/soft to ...med. med. plas., ...residuum. ...weathered. ...vel w/20%+ silt- ...d, med. plas., fines, ...to med. bedded.		CL GC CL GC	
...671 Rng. 0+78 Rt.			
...occ. siltstone ...d, med. plas., ...colluvium. ...& gravel and 10% ...med. plas. ...duum. ...ctured, excavates ...Remainder: ...plas., moist,		CL CL GC CL	
...871 Rng. 0+20 Rt.			
...e. sandstone boulder. ...e sand & gravel. ...e 3'x1.5'x1.5' ...oist, yel. brn. ...ium. ...fractured-Jennings. ...y Gravel. Dense, ...h iron stains, ...which breaks down ...clay. ...ured & fractured. ...Remainder CL or GC.		CL GC	
...+80 Rng. 0+05 Lft.			
...obble or boulder. ...e cobble, med. stiff ...brn., residuum & ...trace sand & gravel ...yel. brn., massive ...ctured. Jennings, ...ally as cobbles. ...ge-completely ...ence as Lean Clay, ...to high plast. ...nl. brns. ...siltstones-Jennings ...ned, excavates as ...inder: CL-GC ...plas., moist,		CL CL CL GC	
...77 Rng. 0+13 Rt.			
...surface boulder. ...stiff, med. plas., ...residuum & ...me as: Gravelly ...stone flags. ...moist, olv. & ...fractured - ...volume small ...dstone. Remainder: ...plas., moist, olv. ...an readily on		CL CL	
...Rng. 0+00			
...boulders 2.5' ...ne. boulders ...noob. brn.		CL	

TP 214 Elev. 2447.8 (continued)

			USCS	Type Bit Rec. Used %
3.0	6.0	Lean to Silty Clay - stiff, med. plas., moist, yel. brn., residuum.	CL	
6.0	12.5	Shale - highly weathered & fractured. Excavates as 25 to 35% soft shale cobbles. Remainder Clayey Gravel. Hard as soil, med. plas., moist, olv. green & brn.	GC	
12.5		Bottom of Hole Dry Hole		

TP 215 Elev. 2446.8 Em. Splwy. Sta. 5+75 Rng. 0+00

			USCS	Type Bit Rec. Used %
0.0	0.5	Topsoil.		
0.5	8.5	Silty Clay - stiff, med. plas., moist to wet (free water in soil joints from 3.5 to 8.5 feet), yel. brn., residuum.	CL	
8.5	12.5	Shale - highly weathered & fractured. Jennings. Recovered as 35% to 45% small cobbles of soft shale & siltstone. Remainder Clayey Gravel, Gravelly Clay. Dense, med. plas., moist, (no free water in this zone), yel. brn. Jennings.	CL GC	
12.5		Bottom of Hole		
	▼	W.L. questionable as to free water in joints. Do not expect quantity to exceed optimum for placement.		

TP 216 Elev. 2443.6 Em. Splwy. Sta. 6+75 Rng. 0+00

			USCS	Type Bit Rec. Used %
0.0	1.0	Topsoil-vegetation, roots. Surface boulders to 2' maximum dimensions of resistant and possibly case hardened sandstone and conglomerate.		
1.0	7.5	Silty Clay, occ. boulder in top 2.5 feet stiff, med. plas., moist (but w/free water in joints below 3.0' to 7.5' depth), yel. brn., massive - residuum & colluvium.	CL	
7.5	11.0	Shale - mod. to highly weathered. Recovered as: Clayey Gravel-Gravelly Clay w/35% small flaggy cobbles of soft shale & siltstone. Dense, med. plas., moist, yel. brn. and olv. w/ironstains. No water below 7.5' depth. Jennings.		
11.0		Bottom of Hole		
	▼	W.L. questionable as to free water in upper soil zone; should not exceed optimum placement moisture.		

TP 217 Elev. 2440.2 Em. Splwy. Sta. 7+40 Rng. 0+00

			USCS	Type Bit Rec. Used %
0.0	1.0	Topsoil-heavy surface boulders. One boulder measures 4-5' long x 3-5' wide, and 2' thick; of conglomerate and sandstone.		
1.0	11.0	Lean Clay-med. stiff to stiff, med. plas., moist, pinks and assorted brns. & grays residuum.	CL	
11.0	12.0	Shale-highly weathered. Excavates as Clayey Gravel w/10% soft shale & siltstone. Dense, med. plas., moist, olv. & yel. brn. Jennings.	GC	
12.0		Bottom of Hole Dry Hole		

TP 218 Elev. 2445.8 Em. Splwy. Sta. 7+51 Rng. 1+00 Lft.

			USCS	Type Bit Rec. Used %
0.0	1.0	Topsoil & vegetation-scattered surface boulders. Boulders are resistant cgl. & SS.		
1.0	8.0	Silty Clay-occ. boulder in top 2.5', stiff, med. plas., moist, yel. brn., residuum & colluvium.	CL	
8.0	11.0	Shale-highly weathered & fractured, reduces easily to: Clayey Gravel w/10% soft cobbles of siltstone & shale. Dense, med. plas., moist, olv. & yel. brn. All coarse mat'l. of shale & siltstone.	GC	
11.0		Bottom of Hole Dry Hole		

TP 219 Elev. 2436.5 Dam Sta. 7+39 Rng. 1+25 Rt.

			USCS	Type Bit Rec. Used %
0.0	1.0	Topsoil w/occ. surface boulder to 2' Boulders of cgl. & SS.		
1.0	11.5	Old Fault Zone-muckled clays w/sand pockets yel. brn., lt. yel. brn., med. stiff to very stiff, med. plas., moist (w/saturated pockets) sand generally coarse, satisfactory for borrow Am't. of free water would not exceed optimum placement condition.		
11.5		Bottom of Hole		
	▼	W.L.?		

AS BUILT

LOGS OF TEST HOLES
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed C. Johnson	Date	Approved by
Drawn C. Taylor		Title
Traced		Title
Checked	Sheet No. 24 of 25	Drawing No. MD 407-6

SCS-313 (9-64)

PLATE NO. 12

TP 220 Elev. 2439.5 Em. Spiwy. Sta. 6+73 Rng. 1+00 Rt.

			USC	Type Bit Hard	Rec. % Core
0.0	0.5	Topsoil-occ. surface boulder of cgl. SS.			
0.5	3.5	Sandy Clay-med. stiff to stiff, med. plas. fines, moist, mottled grys., yel. brn. & greens; residuum-colluvium.	CL		100%
3.5	8.5	Lean Clay w/trace sand & fine gravel, stiff, med. plas., moist, bright yel. brn., residuum.	CL		100%
8.5	12.5	Shale-highly weathered & fractured-Jennings. Excavates easily as 25-35% soft shale cobbles. Remainder: Clayey Gravel. Hard as soil, med. plas., moist, olv. grn. coarse mat'l shale & breaks down readily.	GC		100%
12.5		Bottom of Hole Dry Hole Samples: 220.1 sds 1.0'-3.5' 220.2 sds 3.5'-8.5' 220.3 sds 8.5'-12.5'			

TP 221 Elev. 2436.6 Em. Spiwy. Sta. 4+00 Rng. 0+00

0.0	0.5	Topsoil-surface boulders of cgl. SS.			
0.5	4.0	Silty Clay w/occ. boulder & numerous cobbles stiff, med. plas., moist, redsh. to yel. brn., colluvium-residuum.	CL		
4.0	6.0	Lean Clay-stiff, med. plas., moist, redsh. brn., residuum.	CL		
6.0	11.0	Shale-highly weathered & fractured. Excavates easily as: 25 to 30% small-soft shale cobbles. Remainder: Clayey Gravel-Gravelly Clay. Hard as soil, med. plas., moist, olv. green.	CL GC		
11.0		Bottom of Hole Dry Hole Samples: 221.1 XL ds 6.0'-11.0' 200 sample including soft shale cobbles for special tests.			

TP 254 Elev. 2436.4 Dam Sta. 6+16 Rng. 3+58 left

0.0	0.4	Topsoil & duff.			
0.4	5.2	Clayey Silt, med. stiff to very stiff, sl. plas. (high LL), moist, pale brn. & lt. gray, massive unctuous, residuum.			
5.2	5.9	Silty Sandstone very fine, weathered-fractured mo., hd. (H 4) sl. moist, lt. brn.			
5.9		Bottom of Hole Dry Hole			

TP 255 Elev. 2444.6 Em. Spiwy. Sta. 5+57 Rng. 0+65 Rt.

0.0	0.5	Topsoil & duff-one boulder 3'x1.5'			
0.5	4.3	Clayey Silt-med. stiff, low plas., wet (mod. perm in joints & roots holes) yel. brn. changing to gray w/depth. Alluvium.	CL		100%
4.8	8.6	Silty Clay-med. stiff, med. plas., moist (slo. perm @ 3.1') lt. yel. brn., slick unctuous-residuum of shale.	CL		100%
8.6	12.6	Shale-weathered & fractured-Jennings olive, soft (H 2) clay films.			
12.6		Bottom of Hole W.L. questionable Samples: 255.1 bds 0.5'-4.8' 255.2 bds 4.8'-9.6'			

TP 312 Elev. 2405.5 Dam Sta. 10+35 Rng. 0+86 Lft.

0.0	1.0	Topsoil-cobbles & boulders on surface to 2' maximum dimension. Resistant cgl. & SS.			
1.0	2.0	Clay-Silt, organic w/cobbles & boulders 35% soft, med. plas., wet to sat., brnsh. yel. & gray, has odor.	CL ML		
2.0	6.0	50% volume boulders & cobbles to 3' maximum dimension. Remainder: organic clay w/gravel & sand, soft or loose, saturated, gray, has odor. Gravel is angular sandstone.	CL GC		
6.0	10.5	Silty gravel w/15% flaggy cobbles. Gravel & sand mixture close to well graded. Dense, non plas., saturated & permeable, brn., angular coarse mat'l.	GM		
10.5	11.5	Shale-highly weathered, highly fractured. Soft moist, greensh. gray-resistant @ 11.5' Jennings.			
11.5		Bottom of Hole			

TP 356 Elev. 2408.7 Dam Sta. 7+45 Rng. 1+30 Lft.

0.0	7.7	Cobbles & Boulders to 70% volume of sandstone and conglomerate becoming fine sandy siltstone w/depth. Maximum size 4', matrix of SM, free water slowly perm. @ 3.0' depth. Clay films on surfaces-Talus.			
	▼	W.L. 1.8' 11/9/67			
7.7	9.2	Shale-highly weathered & fractured-Jennings. dk. olv. gray, soft (H 2) clay films, unctuous.			
9.2		Bottom of Hole			

TP 357 Elev. 2407.3 Dam Sta. 9+46 Rng. 0+50 Rt.

0.0	1.0	Vegetation & Topsoil.			
	▼	W.L. approx. 1.0' 10/22/67			
1.0	5.0	Clayey Gravel w/15 to 20% cobbles and boulders med. dense, med. plas., moist to wet, nearly impervious, alluvium.	GC		
5.0	7.5	60% cobbles of sandstone. Remainder: Silty Gravel well graded. Dense, non plas., wet to sat., low perm., coarse mat'l angular, grays, alluvium-colluvium.	GM GC		
7.5	11.0	Sandy Gravel w/trace silt. Dense, non plas., sat. (Perm 1 gpm) grays, alluvium-colluvium.	GP		
11.0	11.5	Shale-weathered & fractured-Jennings. Soft, grey, thin bedded.			
11.5		Bottom of Hole			

TP 604 Elev. 2442.8 Em. Spiwy. Sta. 2+96 Rng. 0+86 Rt.

			USC	Rec. % Core
0.0	2.0	Clayey Silt-stiff, sl. plas., dry, tan residuum.	CL	
2.0	12.5	Fat Clay-stiff, highly plas., moist, red. brn., siltstone cobbles from 2.0' to 5.0'	MH CH	
12.5		Bottom of Hole Dry Hole		

TP 605 Elev. 2405.3 Dam Sta. 10+78 Rng. 0+27 Rt.

0.0	1.0	Topsoil & vegetation.		
	▼	W.L. approx. 1' 10/19/67		
1.0	3.5	Silty Clay w/roots, sl. organic, soft, med. plas., wet to sat. (perm of 1 to 2 gpm. in rootholes & soil joints) yel. brn. & grey, massive-odor of organic material-alluvium.	CL	
3.5	4.5	Vegetation: Old trees, branches, etc., mixed w/cobbles and GC-alluvium.		
4.5	6.0	Clayey Gravel w/25-40% cobbles, med. dense, non plas., wet & sat. (perm. of 1 gpm or more at one end of pit) grays & gray greens. Gravel & cobbles of angular siltstone & fine sandstone alluvium.	GC	
6.0	8.0	Lean Clay w/tr. coarse sand., med. stiff to stiff, med. plas., moist (impervious), gray to lt. brn., very sl. org.-alluvium.	CL	
8.0	10.0	Silty Clay w/some gravel & sand., med. dense med. plas., moist, lt. gray, non perm. alluvium.	CL ML	
10.0	11.0	Lean Clay-stiff, med. plas., moist, gray, residuum.	CL	
11.0	11.5	Shale-non weathered.		
11.5		Bottom of Hole		

TP 606 Elev. 2406.0 Dam Sta. 11+28 Rng. 0+53 Rt.

0.0	1.0	Topsoil & vegetation.		
1.0	5.0	Clay-Silt, soft, low to med. plas., wet to sat. (makes water @ 1 gpm in soil joints), yel. brn. & gray, caves in readily-alluvium.	ML CL	
	▼	W.L. approx. 2' depth 10/19/67		
5.0	6.0	Vegetation-brush, logs, etc. in cobbles and GM, sat., gray, 1 gpm inflow-alluvium.		
6.0	9.5	Clayey Gravel w/occ. angular cobble. Dense low plas. fines, wet (low to no perm.) grays & gray greens; alluvium. May possibly be weathered Jennings.	GC	
9.5	11.5	Either cobbles or highly weathered fine sandy siltstone-difficult to excavate.		
11.5		Bottom of Hole		

TP 607 Elev. 2404.5 Dam Sta. 11+35 Rng. 0+22 Lft.

0.0	1.0	Topsoil & vegetation.		
	▼	W.L. approx. 1.0' depth 10/22/67		
1.0	3.5	Clay-silt w/some fine to coarse sand, loose, low plas., wet to sat. (low perm.)alluvium.	CL ML	
3.5	4.5	Vegetation-limbs, etc., mixed w/cobbles GC		
4.5	6.0	Silty Clay, slightly organic, med. stiff, med. plas., wet, gray - alluvium.	CL	
6.0	10.0	Cobbles & Boulders, 50% by volume, angular of sandstone; remainder: Silty Gravel w/some sand. Dense, non plas., sat., gray sl. organic angular to sub-rounded-alluvium-difficult to excavate.	GM	
10.0		Bottom of Hole		

TP 608 Elev. 2405.1 Dam Sta. 10+45 Rng. 0+50 Lft.

0.0	1.0	Topsoil & vegetation.		
	▼	W.L. approx. 1.0' 10/23/67		
1.0	3.0	Silt-Clay w/some fine to coarse sand, loose or soft, low to med. plas., wet, yel. brn., free water in soil joints - caves readily-alluvium	CL ML	
3.0	6.0	Silty Clay-sl. organic w/some plant roots, soft to med. stiff, med. plas., wet, gray, caves readily, perm. in soil joints, alluvium.	CL	
6.0	8.0	Boulders & cobbles 50% volume maxi. dimen.-2'; remainder: Silty Gravel occ. w/clay, med. dense to dense, non plas., sat. gray matrix, coarse mat'l hard sandstone ang. to sub rnd., high perm. rate. 6.0-6.5 Vegetation.	GC GM GP	
8.0	10.0	Gravelly Clay (may be highly weathered shale-Jennings), very stiff, med. plas., wet w/free water, yel. brn., coarse mat'l siltstone & shale - ironstains.	CL	
10.0		Shale-resistant, non to mod. weathered, resists excavation.		
10.0		Bottom of Hole Samples: 608.1 sds 1.0'-3.0' 608.2 sds 3.0'-6.0' 608.3 sds 6.0'-8.0' 608.4 sds 8.0'-10.0'		

TP 625 Elev. 2405.5 Dam Sta. 11+45 Rng. 1+30 Lft.

0.0	1.0	Topsoil.		
1.0	3.0	Silty Clay w/some sand & gravel, soft to med. stiff, med. plas., moist, yel. brn.-colluvium.	CL	
3.0	6.0	Silty Gravel w/20% sand-40% volume cobbles Dense, low-non plas., sat. (free water 4.5') brn., colluvium.	GM	
	▼	W.L. approx. 4.5' 11/8/67		
6.0	11.0	Shale-highly weathered & fractured. Jennings. Excavates as: Clayey Gravel. Dense, med. plas., wet-sat., olv. grn. Gravel is soft shale & siltstone.	GC	
11.0		Shale-mod. weathered-more resistant-Jennings.		
11.0		Bottom of Hole		

		U S C S	Type Bit Used	Rec. %
		CL		
		MH CH		
		CL		
		CC		
		CL		
		ML CL		
		GC		
		CL CL ML CL		
		GH		
		CL		100%
		CL		100%
		GC GH GP		100%

TP 627 Elev. 2405.5 Dam Sta. 11+10 Rng. 0+00

			N	U S C S	Type Bit Used	Rec. %
0.0	1.0	Topsoil & vegetation.				
1.0	4.5	Silt-Clay w/some fine to med. sand., very soft, low-med. plas., wet to sat. w/free water in joints, yel. brn. alluvium.		CL ML		100%
4.5	5.0	Vegetation-decaying logs, branches, etc., w/cobbles and GM.				
5.0	8.0	Sandy Gravel w/trace silt, few small cobbles med. dense to dense, non plas., sat., grays, coarse mat'l hard sandstone ang. to sub rnd. Has odor, some bits of vegetation, alluvial-colluvial.		GP to GM		100%
8.0	10.0	Sandy Gravel w/20% silt and 10-15% cobbles; dense, non plas., sat., gray, coarse mat'l, thin, flaggy & hard sandstones.		GM SM		100%
10.0	12.5	Shale-highly weathered & fractured. Excavates easily as Clayey Gravel, stiff to hard, med. plas., wet, grays.		GC		
12.5		Bottom of Hole Samples: 627.1 lds 1.0'-2.0' 627.2 lds 5.0'-8.0' 627.3 lds 8.0'-10.0'				

AS BUILT

LOGS OF TEST HOLES
LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

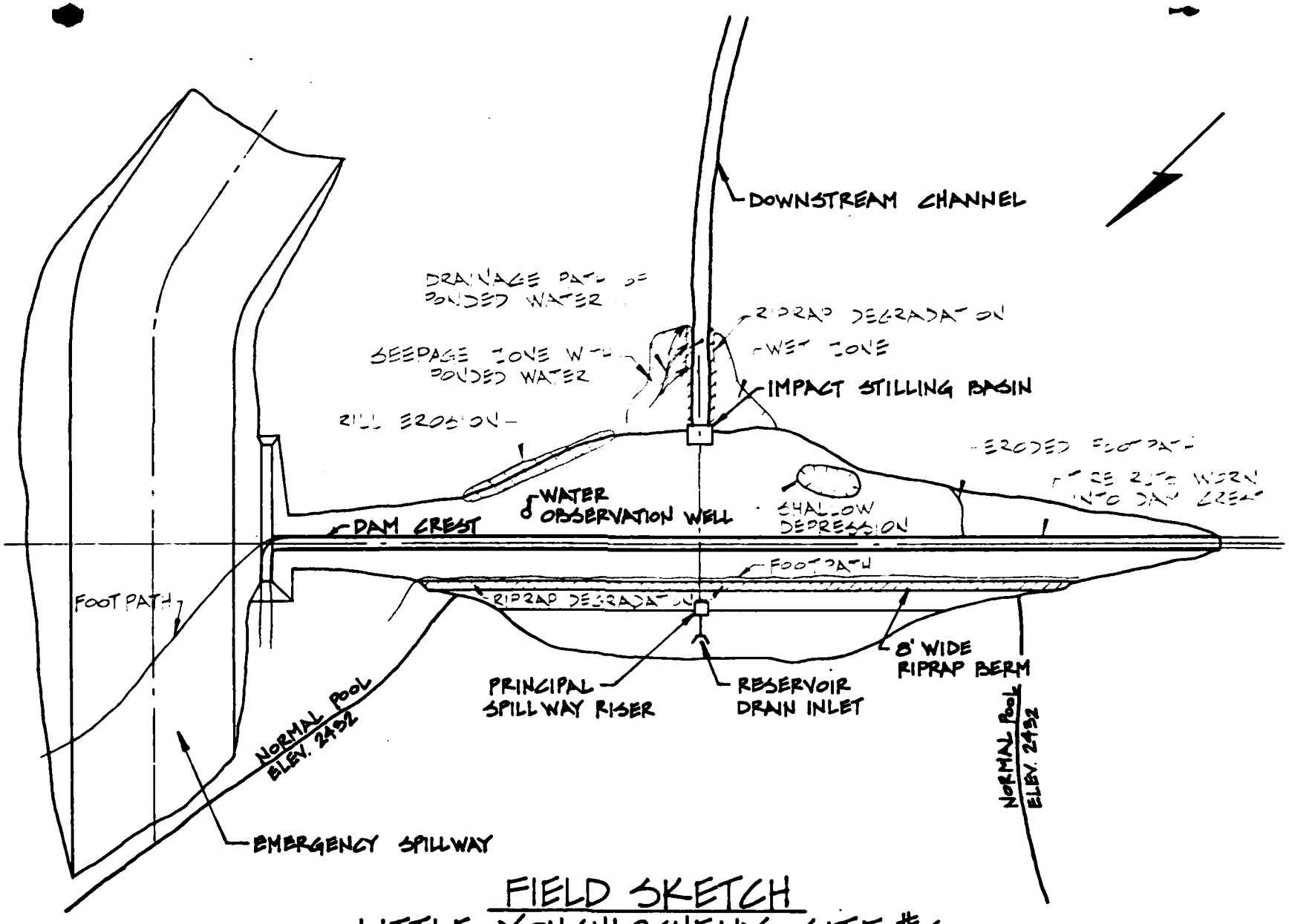
	Date		
Designed E. Johnson		Approved by	
Drawn C. Taylor		Title	
Traced		Title	
Checked		Sheet No. 25 of 25	Drawing No. MD. 407-G

SCS-511 10-Aug

PLATE NO. 13

APPENDIX A

FIELD SKETCH AND VISUAL OBSERVATIONS CHECKLIST



FIELD SKETCH
LITTLE YOUGHIOGHENY SITE #6

VISUAL OBSERVATIONS CHECKLIST

Name Dam Little Youghiogheny Site No. 6 County Garrett State Maryland National ID # MD 36

Type of Dam Earthfill Hazard Category Class I - High hazard

Date(s) Inspection 4/10/79 Weather Clear, Sunny Temperature 50° F

Inspection Review Date 5/24/79 (Ackenheil & Associates personnel only.)

Pool Elevation at Time of Inspection 2,432.1* Tailwater at Time of Inspection Normal M.S.L.

*Pool at riser weir crest elevation.

Inspection Personnel:

Ackenheil & Associates	Water Resources Admin.	Soil Conservation Service
Timothy E. Debes	Jeffrey Smith	Bill DeBarry
James D. Hainley	Thomas Moynahan	Walt Payte
Michael McCarthy		

Recorder Timothy E. Debes

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS*
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Eroded footpath located one foot above riprap berm on upstream slope. Footpath extends the entire length of the dam. Another eroded footpath is located on the downstream slope about 200 ft. from the right abutment. This footpath is about 4 to 6 in. in depth. Downstream embankment slopes appeared saturated and soft.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical camber noted along length of dam crest. No horizontal misalignment was observed.	
RIPRAP FAILURES	Riprap placed on the upstream slope berm is disintegrating into small fragments. (Refer to Photograph No. 2.) Exit channel riprap also shows evidence of weathering.	

*REFER TO REPORT SECTIONS 3 AND 7

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	None evident.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Junctions are generally in good condition with the exception of some rill erosion on the left dam abutment junction.	
ANY NOTICEABLE SEEPAGE	The downstream toe area is very saturated on both sides of the impact stilling basin. Water was observed ponded about 3 - 4 in. deep on the east side of the exit stream channel. Ponded water drains into the exit stream channel at several locations along the stream bank. Observed flows were estimated at rates between 1 and 3 gpm.	
STAFF GAGE AND RECORDER	None.	
DRAINS	A 12 in. dia. seepage drain pipe exits from each side wall of the impact stilling basin. Each corrugated metal outlet drain had a clear discharge and an estimated flow rate of 10 gpm.	

OUTLET WORKS

(Pond Drain)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed.	
INTAKE STRUCTURE	Slide gate was exercised and found operable. Exposed concrete surfaces were observed in good condition, no spalling or cracking was evident.	
OUTLET STRUCTURE	Concrete impact stilling basin is in good condition. Exposed concrete surfaces observed free of cracking and spalling.	
OUTLET CHANNEL	Exit stream channel side slopes are lined with limestone riprap (see field sketch - riprap extends from impact stilling basin to 60 ft. downstream of dam). Downstream channel banks are vegetated with grass and appear stable.	
EMERGENCY GATE	Not applicable.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Not applicable.	
APPROACH CHANNEL	Approach channel observed free of debris, erosion, woody vegetation, and flow obstructions. An eroded motorbike path extends across the channel and both spillway side slopes. (Refer to field sketch.) Channel is cut into natural earth and is vegetated with a dense grass.	
DISCHARGE CHANNEL	Channel bottom and side slopes are stable and free of flow obstructions.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Soil Conservation Service benchmark located on dam centerline, about mid-dam length. (Damaged, elevation numbers are not discernible, however, as-built drawings indicate an elevation of 2,449.83.) Soil Conservation Service benchmark located on impact basin inlet wall (El. 2,412.96).	
OBSERVATION WELLS	A total of six (6) observation wells are located on upstream and downstream embankment slopes at dam centerline Stations 8+00 and 9+50.	
WEIRS	*None.*	
PIEZOMETERS	None.	
OTHER	Not applicable.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir slopes have gentle to moderate inclinations, are well vegetated, and appear stable. No evidence of landslides, embankment sloughing, or shoreline erosion was observed.	
SEDIMENTATION	Reservoir and outlet pipe discharge water observed clear. Feeder streams have stable banks and channel bottoms, and reportedly transport small quantities of sediment.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	None observed.	
SLOPES	Channel side slopes are stable and vegetated with grass.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately eight (8) inhabited structures are located in the downstream floodplain between the dam site and the Little Youghiogheny River confluence.	

POST-INSPECTION REVIEW OF SEEPAGE ZONE

VISUAL OBSERVATION

Visual observation of site conditions on July 19, 1979 confirmed visual observations made on April 11 and May 24, 1979. This data is presented in Section 3.1-b(2) and page A-4 of Appendix A.

LABORATORY INVESTIGATION

Soil samples were obtained from the seepage zone and stream channel bank. Mechanical analyses and Atterberg Limit tests yielded the following results:

	U.S.C.S. Classification	LL	PI	% Sand
Soil from seepage zone	ML	33	8	25
Soil from seepage zone	ML	32	8	32
Soil from stream channel bank	ML	34	9	20

DESIGN REPORT

Soil test results, obtained from Little Youghiogheny Site No. 6 Design Report, indicate dam foundation and embankment soils have the following physical properties:

	U.S.C.S. Classification	LL	PI	% Sand
Foundation soils	ML	27-41	6-13	16-30
Embankment soils	CL	31-42	10-18	27-39
Embankment soils	ML	38	9	33

CONCLUSION

The cause and origin of the observed seepage could not be conclusively established by visual observation. However, correlation of foundation, embankment, and seepage zone soil physical properties suggests the seepage may be transporting silt soil from the embankment and/or foundation. The presence of silt material in the seepage zone is believed to indicate that gradual piping may be in progress.

APPENDIX B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM: Little Youghiogheny Site No. 6

ID #: MD 36

ITEM	REMARKS
AS-BUILT DRAWINGS	As-built drawings available from Soil Conservation Service, College Park, Maryland.
REGIONAL VICINITY MAP	See Appendix E. U.S.G.S. 7.5 minute quadrangle map showing site location.
CONSTRUCTION HISTORY	Dam designed by U.S. Department of Agriculture, Soil Conservation Service in 1968. Construction was started June 5, 1970, under the supervision of the Soil Conservation Service, and completed October 1971. Construction history was obtained from Construction Report for Little Youghiogheny Site No. 6.
TYPICAL SECTIONS OF DAM	See Plates 1 through 5 for details of earthfill embankment and cutoff trench.
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	See Plates 1, 3, 6, & 7 for details of principal spillway riser, outlet pipe, and impact stilling basin. Available in design report.
RAINFALL/RESERVOIR RECORDS	Not available.

ITEM	REMARKS
DESIGN REPORTS	Design Report, Little Youghiogheny River Watershed Multiple Purpose Dam No. 6, Garrett County, Maryland, prepared by Soil Conservation Service, 1968. Report may be obtained from the Maryland Water Resources Administration or the Soil Conservation Service.
GEOLOGY REPORTS	A detailed geology report is included in the above identified document. The report was prepared by Gary Jamison, Geologist, November 8, 1967.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	The following is included in the Soil Conservation Service design report: 1) Hydrology and hydraulic design computation summaries, routing calculations, stage-storage and hydraulic discharge rating curves. 2) Static slope stability results and trial slip circles. 3) Calculations evaluating dam stability against piping and in-situ seepage measurements of foundation materials.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	The following is included: 1) Summaries of test pit and drill hole explorations. 2) Summaries of physical and engineering property soil tests conducted on foundation and borrow soils.
POST-CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Borrow source locations are shown on as-built drawings.

ITEM	REMARKS
MONITORING SYSTEMS	A total of six (6) observation wells are installed in the dam embankment and downstream area. Embankment wells are located at centerline Stations 8+00 and 9+50.
MODIFICATIONS	None reported.
HIGH POOL RECORDS	None recorded.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	In 1973, a water-supply pipeline was installed across the dam crest and upstream emergency spillway channel.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Annual maintenance and operation inspection reports are available from Soil Conservation Service district offices in Oakland and Hagerstown, Maryland.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See Plates 2 and 3 for details of emergency spillway channel and control section.
OPERATING EQUIPMENT PLANS & DETAILS	None available.
SPECIFICATIONS	Construction and Material Specifications for Little Youghiogheny River Watershed Multiple Purpose Dam No. 6, prepared in 1968 by Soil Conservation Service.
MISCELLANEOUS	1) Construction Specification 409 - Pressure Grouting 2) Proceedings of Public Hearings held January 14 and 30, 1969. 3) Waterway Obstruction Permit G-69-Ob-2, dated February 24, 1969. 4) Photographs of dam construction can be reviewed at the Soil Conservation Service district office in Hagerstown, Maryland.

APPENDIX C

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA AND CALCULATIONS

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 43% cropland (CN = 78), 21% woodland (CN = 73), 21% pasture (CN = 61), remainder farmsteads and urban development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 2,432.0 ft. (1,410 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 2,448.0 ft. (5,000 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 2,441.8 (3,250 ac.-ft.)

ELEVATION TOP DAM: 2,449.0

EMERGENCY SPILLWAY

a. Elevation 2,437.6 ft.
b. Type Trapezoidal open channel
c. Width 200.0 ft.
d. Length 920.0 ft.
e. Location Spillover Left (east) abutment
f. Number and Type of Gates None

OUTLET WORKS

a. Type Concrete drop inlet riser and 48 in. dia. R.C. pipe
b. Location 630 ft. from the right (west) abutment
c. Entrance Inverts Weir crest openings El. 2,437
d. Exit Inverts El. 2,402.7
e. Emergency Drawdown Facilities Hand operated 30 in. dia. slide gate housed in principal spillway riser.

HYDROMETEOROLOGICAL GAGES

a. Type None
b. Location N/A
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE Unknown

LITTLE YOUGHIOGHENY SITE NO. 6
HYDROLOGY CALCULATIONS

Determine rainfall amount for PMF design storm

A. PMF rainfall for Garrett Co., Maryland

26.8 in./6 hr.

Obtained from "Design of Small Dams" pg. 48 by U.S. Dept. of Interior.

Data based on Hydrometeorological Report No. 33, National Weather Service.

B. PMF rainfall adjustment

Watershed area = 6.8 sq. mi.

Reduction factor = 0.8 (for watershed areas less than 10 sq. mi.)

Therefore, adjusted PMF rainfall =

0.8 x 26.8 = 21.44 in./6 hr.

Say, 21.5 in./6 hr.

SCS-319 A (3-61)

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

JUD 10/29/65

HYDROGRAPH COMPUTATION

Freeboard Storm

WATERSHED OR PROJECT Little Yok #6 STATE Md

STRUCTURE SITE OR SUBAREA

DR. AREA 6.82 SQ. MI. T. 1.9 HR. RUNOFF CONDITION NO. II

RUNOFF CURVE NO. 75 STORM DISTRIB. CURVE B HYDROGRAPH FAMILY NO. 1

STORM DURATION 6 HR RAINFALL: POINT 26.3 IN. AREAL -- IN.

Q 22.68 IN. COMPUTED T_p 1.33 HR. T_o 5.65 HR.

$(T_o + T_p)$: COMPUTED 4.25 ; USED 4.00 . REVISED T_p 1.41

$q_p = \frac{484\ A}{REV.\ T_p}$ = 2341.0 CFS. Qq_p = 53,093.9 CFS.

t(COLUMN) = (t/T_p) REV. T_p. q(COLUMN) = (q_a/q_p) Qq_p.

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	6	0	21	9.87	319	41		
2	6.41	153	22	10.36	212	42		
3	6.99	796	23	10.96	159	43		
4	7.35	2602	24	11.35	106	44		
5	7.97	6477	25	11.84	53	45		
6	8.47	15,822	26	12.34	0	46		
7	8.96	28,034	27			47		
8	9.45	31,060	28			48		
9	9.95	27,503	29			49		
10	10.44	21,928	30			50		
11	10.94	17,733	31			51		
12	11.43	14,495	32			52		
13	11.92	12,265	33			53		
14	12.42	9,822	34			54		
15	12.91	6,796	35			55		
16	13.40	3,245	36			56		
17	13.90	2,129	37			57		
18	14.39	1,487	38			58		
19	14.88	903	39			59		
20	15.38	531	40			60		

C3

RESERVOIR FLOOD ROUTING

By [illegible] 11/67
Ck [illegible] 1/68

Site Maryland Little York Site 6

Class C V_{sd} = 1410 AF V_{ud} = ___ AF V_s = 1410

Status Freehold Area 6.82 mi² Runoff 22.68 in. Q_I = 31,060

Storm Duration 1 hr. 4" V_I = 53.33 x Runoff x D.A. = 8,249 AF

H_d = ___ ft Γ_s = ___ ft V_{cf} = ___ AF V_{sx}/V_I = ___

Q_1 = ___ cfs V_{cf}/V_I = ___ V_{of}/V_I = ___

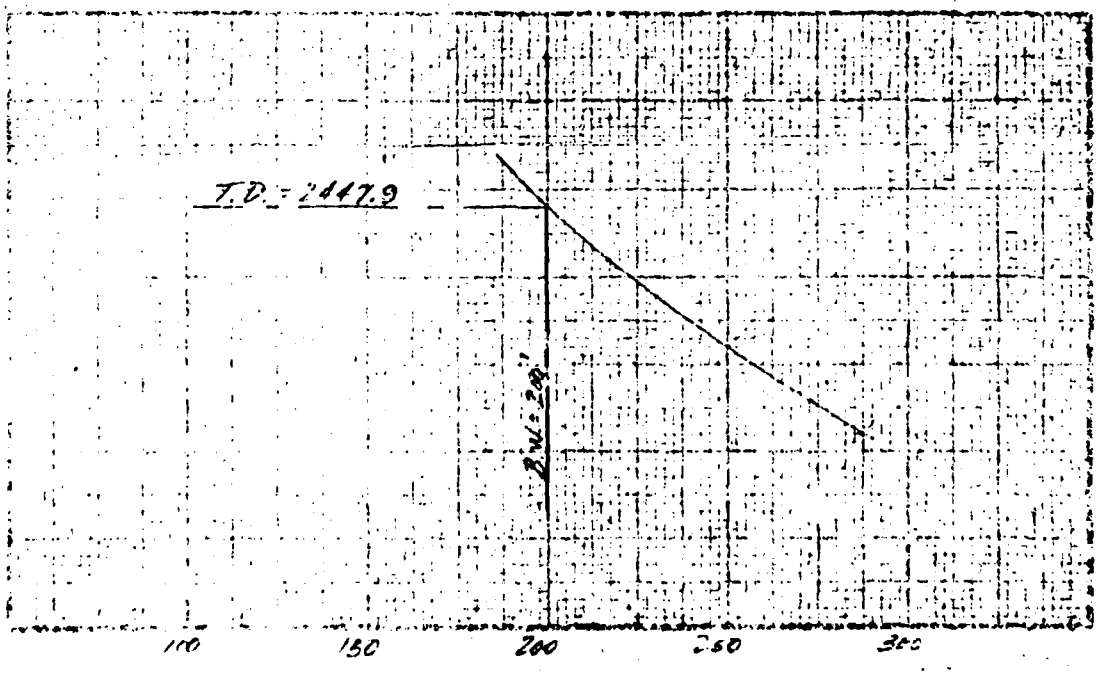
E_s = 2437.6 ft 3 / L = 400 ft V_{sx}/V_I = .112

V_{sd} = 2337 AF Use 1 / S_o = 1 % $V_{sp}/V_I + V_{of}/V_I$ = .112

V_{sp} = 927 AF Q_1 = 276 cfs V_{sp}/V_I = .120

Q_{sp} = 345 cfs n = .009 V_{cf}/V_I = .008

1 E_w ft	2 A_w AF	3 V_w AF	4 V_w/V_I	5 V_{sp}/V_I	6 Q_o/Q_I	7 Q_o cfs	8 Q_c cfs	9 H_p ft	10 Q_c/b	11 b ft
2446.6	4530	3180	.386	.394	.62	19257	18912	9.0	66.0	287
2447.1	4710	3310	.401	.409	.60	18636	18291	9.5	73.0	251
2447.6	4900	3490	.423	.431	.57	17704	17359	10.0	80.0	217
2448.1	5050	3640	.441	.449	.55	17083	16738	10.5	87.5	191



C4

Emergency Spillway Width (b) = ft

APPENDIX D

PHOTOGRAPHS

PHOTOGRAPH 1	Overview of downstream embankment slope and dam crest looking west.
PHOTOGRAPH 2	Riprap berm on upstream slope at normal pool level. Note disintegrated rock riprap and footpath.
PHOTOGRAPH 3	Overview of reservoir and shoreline.
PHOTOGRAPH 4	Emergency spillway inlet channel looking upstream.

1

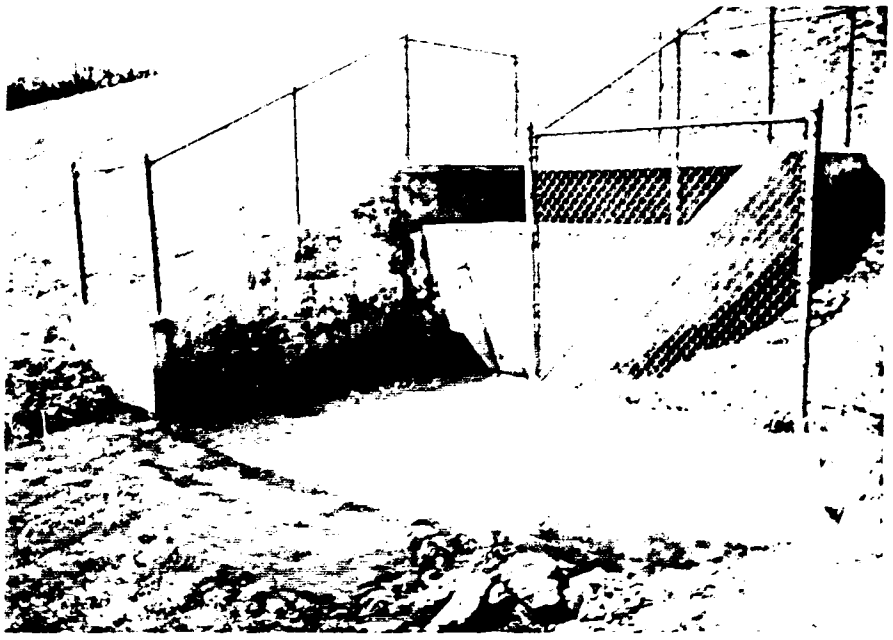
2

3

4

PHOTOGRAPH 5	Principal spillway intake structure.
PHOTOGRAPH 6	Impact stilling basin with baffle block.
PHOTOGRAPH 7	Overview of downstream exit channel and seepage zone near left abutment.
PHOTOGRAPH 8	Inhabited residences located adjacent to Broad Ford Run.

5



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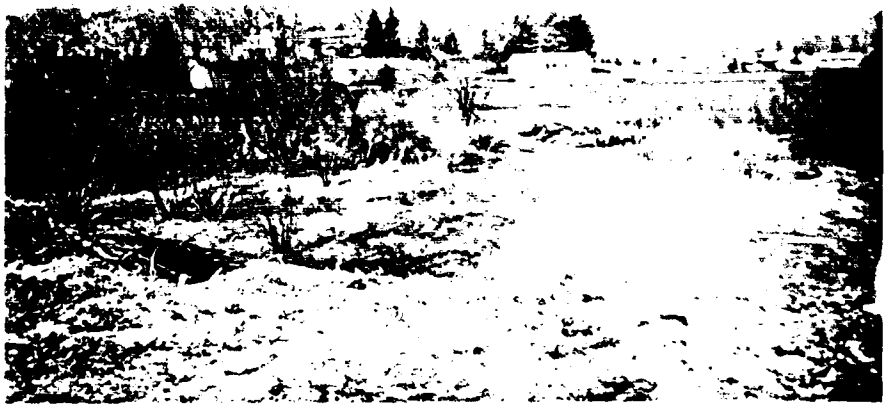
7



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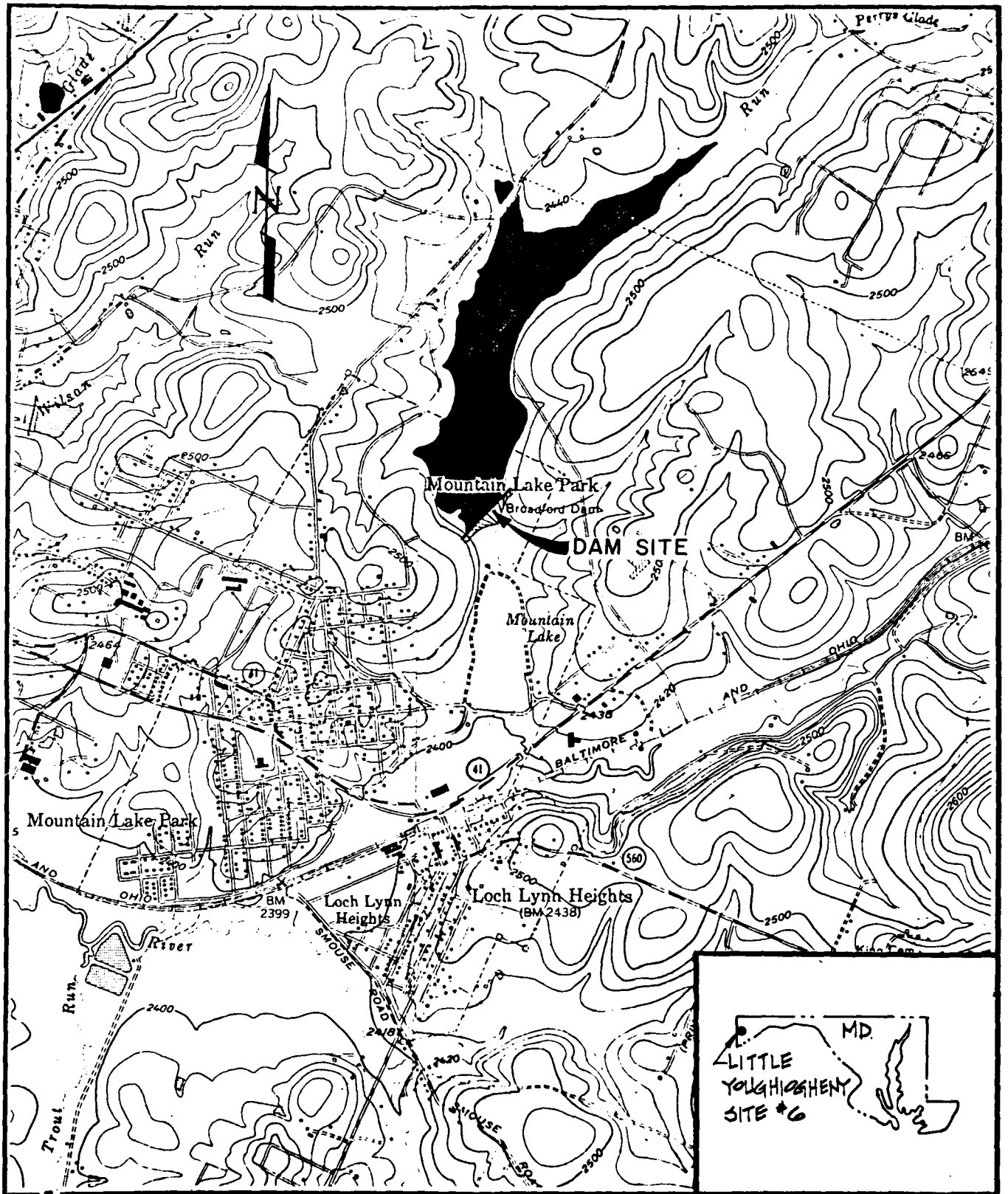
APPENDIX E

REGIONAL LOCATION PLAN



DATE: JULY 2, 1979	NATIONAL DAM INSPECTION PROGRAM	LOCATION PLAN OF LITTLE YOUGHIOGHENY SITE #6
SCALE: 1:24000		
DR: JLM CK: TED	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS BALTIMORE, MD.	
DWG. NO. E1		

APPENDIX F

REGIONAL GEOLOGY

LITTLE YOUGHIOGHENY RIVER DAM SITE NO. 6
NDI I.D. NO. MD 36
REGIONAL GEOLOGY

GENERAL

Little Youghiogheny Site No. 6 is located in the Allegheny Plateau Physiographic Province. The predominate macrostructure of this region is the northeast trending Deer Park Anticline, which extends through eastern Garrett County into Pennsylvania.

The dam is located near the axis of the Deer Park Anticline and is underlain by the Upper Devonian Jennings Formation. This formation consists of interbedded shale, siltstone and sandstone with a few conglomerate beds. The Jennings Formation mesostructure contains abundant minor folds and is exposed in a belt 3-5 miles wide. This belt forms the central section of the Deer Park Anticline. Bedding at the dam site generally strikes N 43° W and dips 7° NE.

SITE GEOLOGY

The general area of the dam site has been identified with numerous fault zones. One fault zone is reportedly located beneath the flood plain and left (east) dam abutment. This fault intersects the centerline of the dam at approximately Sta. 10+00. (Refer to Regional Geology Plan.) The fault strikes N 15° W and has a vertical displacement of 115 ft., according to Soil Conservation Service geology report. Drill hole logs indicate slickensides were commonly encountered in the shale and sandstone bedrock of this fault zone.

A system of minor faults is also present at the dam site. Based on evidence obtained from drill hole logs, fault rubble zones are located at dam centerline stations 7+70, 9+10, and 16+98. The faults reportedly trend N 70°-80° W and have rubble zones of varying thickness and depth. Topographic interpretation suggests additional faults may exist at the right (west) abutment.

According to Soil Conservation Service geology report, the N 15° W trending fault was believed subject to a change in orientation by the N 70°-80°o W trending faults, resulting in the offset of the fault located at the left (east) dam abutment. The dip of these faults is unknown due to the complexity of the multiple fault planes.

Drill hole logs indicate the rubble zone of these fault systems vary in thickness from 2 ft. to about 34 ft, and extend at least eight (8) ft. below the grout curtain (El. 2,370.0).

In addition to these fault zones, accommodation sliding of the competent sandstone in relation to the incompetent shale has produced tension cracking in the sandstone and thin mud gouges (failure planes) in the shale bedrock.

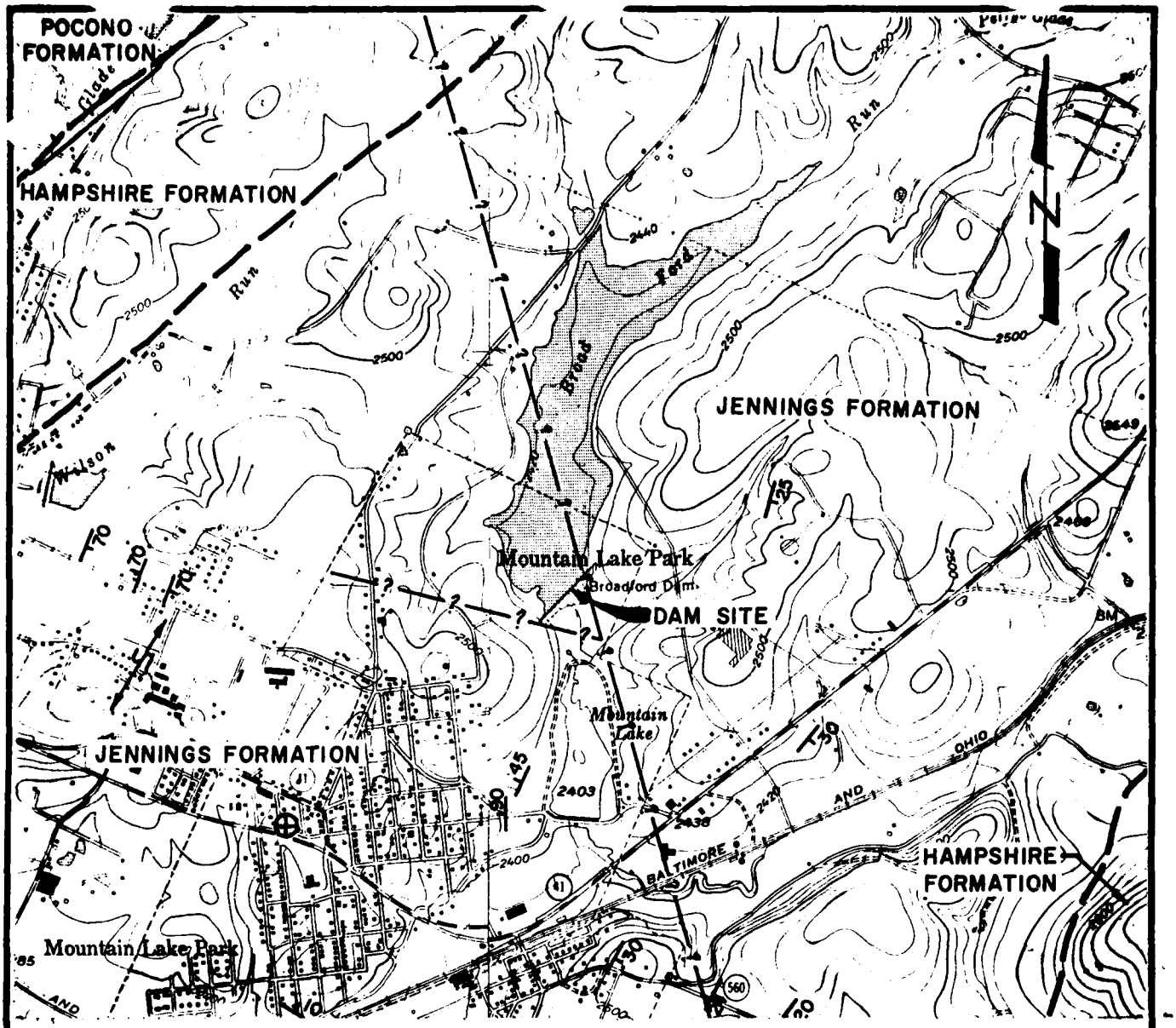
Ground water conditions at the dam site are complex. The general dip of the bedrock from west to east in conjunction with faulting, has resulted in artesian pressure. Artesian pressures of one (1) ft. up to five (5) ft. above ground level were encountered. (Drill holes: DH 620, DH 18, and DH 311; see Plate No. 1 for location.)

References

Maryland Geological Survey, 1953, reprinted 1965, Geologic Map of Garrett County.

Maryland Geological Survey, revised 1961, reprinted 1966, Bulletin 19, Geolography and Geology of Maryland.

Jamison, Gary, 1967, Geology Report of Little Youghiogheny River Watershed Reservoir No. 6.



DEER PARK AND OAKLAND QUADRANGLES, GARRETT COUNTY, MARYLAND

SCALE: 0 — 1/2 MILE 1:24000

CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL

— — — FORMATION CONTACT

—?— APPROXIMATE TREND OF FAULT

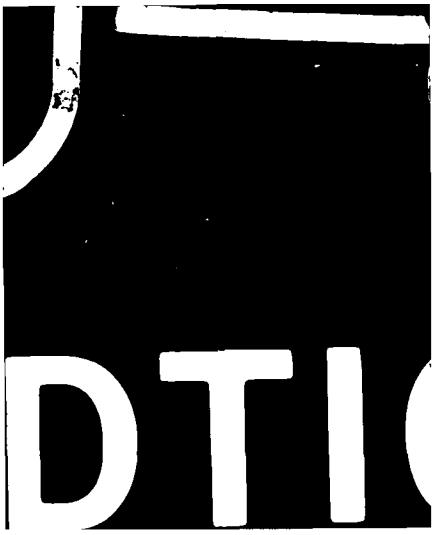
STRIKE AND DIP

⊕ HORIZONTAL BEDDING

OVERTURNED BEDS

DATA OBTAINED FROM MARYLAND GEOLOGICAL SURVEY'S GEOLOGIC MAP OF GARRETT COUNTY, 1953 REPRINTED 1965

DATE: JULY 2, 1979	NATIONAL DAM INSPECTION PROGRAM	SITE GEOLOGY OF LITTLE YOUGHIOGHENY SITE # 6
SCALE: AS SHOWN		
DR: JLM CK: T.E.D.	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS BALTIMORE, MD.	
DWG. NO. F 3		


DTI